EFFECTIVENESS OF MODIFIED INTRA HOSPITAL TRANSPORTATION CHECKLIST TO REDUCE TRANSPORT RELATED COMPLICATIONS AMONG CRITICALLY ILL PATIENTS

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CERTIFICATE

This is to certify that the dissertation entitled **"A STUDY TO ASSESS THE EFFECTIVENESS OF MODIFIED INTRA HOSPITAL TRANSPORTATION CHECKLIST TO REDUCE TRANSPORT RELATED COMPLICATIONS AMONG CRITICALLY ILL PATIENTS IN ICU'S AT KMCH, COIMBATORE"** is submitted to the faculty of Nursing, **THE TAMIL NADU Dr. M. G. R. MEDICAL UNIVERSITY, CHENNAI** by **Reg. No. 301410452** in partial of requirement for the degree of master of Science in Nursing. It is the bonafide work done by her and the conclusions are her own. It is further certified that this dissertation or any part thereof has not formed the basis for award of any degree, diploma or similar titles.

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LIST OF ABBREVIATIONS

SL.NO	ACRONYMS	ABBREVATION
1.	Computerized Tomography	CT
2.	Endotracheal Tube	ET
3.	Intensive Care Unit	ICU
4.	Intra Hospital Transport	IHT
5.	Kovai Medical Center and Hospital	KMCH
6.	Magnetic Resonance Imaging	MRI
7.	Neuro and Trauma Intensive Care Unit	NTICU
8.	Partial Pressure of carbon dioxide	$PaCO_2$
9.	Tracheostomy tube	TT
10.	Ventilator associated Pneumonia	VAP

CHAPTER- I

INTRODUCTION

"Be cautious, life is precious"

The health care providers and patients face multiple challenges, where new treatment modalities and technology interfere with the continuing effort to strive for quality care and expected outcomes. Competence and cost effectiveness must go hand in hand, to satisfy the patients and to improve the quality of care. While encouraging the renovations, it makes a sense; their variant effects need to be screened.

The development of ultra modern technology, and refined medical interventions, which help patients to walk out of the hospital, was unbelievable a few decades back. In order to gain maximum outcomes out of advanced technologies, it is necessary for health care professionals to follow standard guidelines to reduce the related complications among patients.

Transport in a hospital environment is mainly classified to prehospital transport, intra-hospital transport, inter-hospital transport and air transport of patients. Transport of patients is an administrative concern. It requires adequate planning, assessment and adequate stabilization of the patient before transport. Minimum standards for transport of critically ill patients are the administrative guidelines, categories of transport, staffing, transport, equipment, monitoring and training (ANZCA Guidelines 2015). The decision for transport is based on an assessment were the potential benefit outweighs the risks. And transport of critically ill patient result in change in therapy in large number of patients and demands specialist's care.

Critically ill patients are more prone to face transport related complications than general ward patients ascribed to their severity of illness and physiology adapted equipments . Numerous mishaps occur during transport of critically ill patients which ends in life threatening effects. The mishaps can be patient related, staff related and equipment related. Transport related complications increases the mortality, morbidity and cost. It causes life threatening complications such as cardiac arrest, hypoxia, hypotension,

hypertension, increase in vasopressor requirement from baseline, accidental removal of chest tubes, accidental extubation, arrhythmias and so on. Minor and miscellaneous complications give way to the major ones. Early rectification of these minor and miscellaneous complications give turn to reduce the major complications.

Nurses contribution to reduce transport related complications play foremost role. The critical conditions of the patient warrant the support of advanced equipments. ICU staffs has a crucial role in developing transport standards and protocols to reduce the transport related events. Implementation of transport checklist plays a vital role in enhancing the patient safety and to reduce the transport related complications.

Research evidences supports the implementation of transport checklist to the setting. Transport is a multidisciplinary effort which comprises of numerous activities. As per the norms uniform care should be followed in the ICU patients even in and out of the ICU. A proper equipment setting as like in ICU should be accompanied along with the patient, during transport.

Transport mainly comprises of accompanying personnel, selection of appropriate equipment and patient physiological monitoring. The complications acts like a scenario. Complications proceeds from a simple event to complex event. This results in prolonged length of stay. Most episodes of complications are developed from failure in oxygen supply, disconnection of inotroph, oversedation, ignorance of finding and so on.

As per the Indian society of Critical Care Medicine guidelines (2007) intra-hospital transport involves protocol development and written procedures, the decision to transport, identifying high risk patients, preparation of the patient, accompanying personnel, equipment, drugs, pretransport coordination & communication between the accompanying personnel, equipment, drugs and monitoring, care during transport and care at destination.

NEED FOR THE STUDY

"You are the key to your patient safety"

Indian ICUs range from state of the art ICUs; which can compete with the best in the world; to basic ICUs. It is a difficult task to develop guidelines for such diverse requirements. There is not much Indian data available due to scarcity of evidence in many areas. (ISCCM Guidelines). Transport protocol should include the assessment of risk and benefits of moving the patient, minimum equipment required for monitoring and life support, trained accompanying personnel, transport checklist and a register for documentation of adverse events.

The reported global incidence rate range from 6% to 70% (Waydhas 1999). There is no Indian data published on transport of critically ill patients. (ISCCM Guidelines). Equipment and monitoring related complications have been reported from range of 10-34% during transport (Wallen, et.al, 1995). Successful intra-hospital transport directly depends on the planning and organization of the multidisciplinary team as well as appropriate monitoring and intervention during transport.

Knight, et.al, (2015) described the potential complications caused due to intrahospital transport of critically ill patients are pulmonary complications, haemodynamic complications, nosocomial infection, isolated complications during transport of patients with spinal injury and brain injury, patients with hypoglycemia and hyperglycemia, patients in acid-base disturbances which are considered to be more cautious.

Pulmonary complications are associated with IHT (Intra Hospital transport) are often attributed to equipment related issues and may be increased with manual ventilation related to mechanical ventilation. The pulmonary complications are airway loss, risk for pneumothorax, atelectasis, deep vein thrombosis which lead to pulmonary embolism. (De Lassence, et.al, 2006)

Haemodynamic complications such as cardiac arrest is considered as a dreaded complication. Its incidence is between 0.34% and 1.6%, Damm, et.al, (2005) provided the evidence for the risk of tachycardia, hypotension and cardiac complications more during transport.

Nosocomial infections are the leading cause of morbidity and mortality in non-cardiac ICU patients. Intra hospital transport is a potential risk factor for infection. VAP is suggested as a risk factor for mechanically ventilated patients who has been transported. (Kollef, et.al, 1997).

Transport of critically injured patients are at risk for complication during transport, mainly for orthopaedic and neurosurgical patients because various traction, monitoring and stabilization devices must be perfectly aligned and secured or else patient's functional outcomes may be affected. Spinal injury is the most critical. Minor patient manipulation without proper precautions may result in severe injury. (Conrad et.al, 2012)

Interruption of critical or specialty therapies causes complications. The interruption in vital infusions like sedation, analgesia, vasopressor, inotroph and potential medication errors will result in serious adverse effects. (Stawicki & Gerlach 2009)

Another factor is hypoglycemia and hyperglycemia. (Schwebel, et.al, 2013) reported that hyperglycemia during IHT was nearly 2.3 times more likely when compared to the control patients. The degree of glycemic control and the associated glycemic variability both correlate with patient outcomes, close attention should be paid to glucose regulation during all phases of patient care, including IHTs.

Acid - base disorders are due to ventilator changes, alterations in intravenous fluid infusions, interruptions in vasoactive drug administration, as well as altered circulatory dynamics and end- organ perfusion can result in perturbations in systemic acid base milieu during IHTs. Acidotic conditions alter vasopressor effectiveness and predispose patients to arrhythmias. Braman, et.al, (1987) suggested that IHT may result in non trivial changes in pH and $PaCO_2$ with the associated potential for alterations in patient physiology.

Choi, et.al, (2012) reveals that personnel and equipment considerations during patient transfers also give way to complications. Appropriately trained personnel, properly functioning equipment, adequate documentation and pertinent checklists are vital. Frequent checks are essential for both patient and equipments.

Emergent or unexpected situations during intra-hospital transfers are not to be negotiated. McLenon (2004) supports a specialized transport team, coordination, communications and resource availability. It is important that formal, written protocols for IHT is developed by a multidisciplinary team and evaluated by a quality improvement process for each institution. According to American College of Critical Care Medicine, a blood pressure monitor, pulse oximetry, and cardiac monitor should accompany every high-acuity IHT without exception. In addition to that equipment for emergency airway management and an oxygen source to provide for projected needs plus an extra 30 minute reserve. The minimal requirements in IHT destination locations include suction device, an oxygen source, accessible electric connections, monitoring devices with equal caliber to the ICU, and a readily available "crash cart". And also basic resuscitation drugs for cardiac arrest or arrhythmias, inotropes, vasopressors and anti arrhythmic medications should be available. A complete array of commonly used pharmaceuticals, such as sedatives and narcotic analgesic, calcium, and bicarbonate should be available for transportation, and at receiving location.

Complications that occurred during transport are either related to nursing/ medical errors/ worsening of patients physiological condition (Harish, et.al, 2016). Nurses awareness regarding transport related complication has be updated. And even in many of the Indian hospitals the usage of transport protocol is an upcoming task. The intra-hospital transport of critically ill patients comprises of multidisciplinary actions. Which cannot be displayed as like a protocol in the words. To prevent the transport related complications a checklist which comprises of all the transport phases makes the standard of care as well as promote quality of care (Shields et.al, 2015).

The checklist was developed as per the hospital facilities and requirements needed to fulfill the scarcity in patient quality of care. The checklist which helps in continuous monitoring of patient, systematic approach to transport, a trained multidisciplinary team

as well as documentation of care during the patient absence from ICU. The basic principle of this checklist was to guide the transport team through different phases. And also the transports carried by the ICU team are planned but it lacks documentation of care. Hence the researcher formulated a intra hospital transport checklist.

STATEMENT OF THE PROBLEM

A study to assess the Effectiveness of Modified Intra Hospital Transportation Checklist to reduce Transport related Complications among critically ill patients in ICU's at KMCH, Coimbatore.

OBJECTIVES OF STUDY

Objectives of the study were to,

1) Assess the frequency and nature of occurrence of intra hospital transport related complications among critically ill patients.

2) Determine the effectiveness of modified checklist in reducing transport related complications among critically ill patients.

3) Associate the demographic variables with transport related complications.

OPERATIONAL DEFINITIONS

INTRAHOSPITAL TRANSPORTATION

It refers to shifting of patient from ICU to other departments to undergo CT scan, MRI scan and angiography.

MODIFIED INTRA HOSPITAL TRANSPORTATION CHECKLIST

It is a modified checklist framed by the researcher after reviewing recent research evidences on intra hospital transportation of critically ill patients, comprises of pre transport, during transport and post transport monitoring of patients, to minimize the adverse events.

TRANSPORT RELATED COMPLICATIONS

Refers to the complications which may cause deterioration in cardio pulmonary functions, equipment failure or patient fall.

CRITICALLY ILL PATIENTS

Patients who need continuous haemodynamic monitoring and specific care.

HYPOTHESIS

There will be significant reduction in transport related complications among critically ill patients after implementation of modified intra hospital transport checklist.

ASSUMPTION

Critically ill patient are subjected to complications during intra hospital transportation process.

CONCEPTUAL FRAMEWORK

The conceptual model is the scientific skeletal basis on which the building of proposed study is built. It is developed with the aid of reviewing research findings, investigator's experience and comprehension. The illustrative representation of ideas and concepts help the investigator to transfer the ideas to others easily. It gives a 'concrete' basis for 'abstract' ideas.

The conceptual model for this study was developed from Donabedian's Program Evaluation Model (1982). This model consists of three aspects namely; structure, process and outcome. Good quality structure with an effective program gives a positive outcome. After reviewing many literatures this particular model was selected, because the investigator measured the effectiveness of the protocol.

1. STRUCTURE

It includes infrastructure, equipments and supplies, manpower etc. In the present study the structure includes the nature of the potential patients to be served and the technology / resources necessary for transport to occur, along with the skill level of the transport team interact with the overall structural configuration of the hospital to produce the unit level organizational structures as characterized by standards of care, available resources, and policies and procedures that have been put in place regarding intra-hospital transport of patients.

2. PROCESS

It is the activities carried out with help of structure to achieve the outcome. In this study, it includes the assessment of transport related complications in routine practice, implementation of a transport checklist which is integrated with all aspects of care during transport, proper transport team and documentation of care.

3. OUTCOME

Outcomes for the study which executes the process through structure. In this study the outcome includes reduction in the occurrence of transport related complications. If the outcome is positive, it ensures that both the structure and process is functioning effectively. In this study, the occurrence of transport related complications was reduced, it shows the evidence that proper intervention was rendered through the available structure.

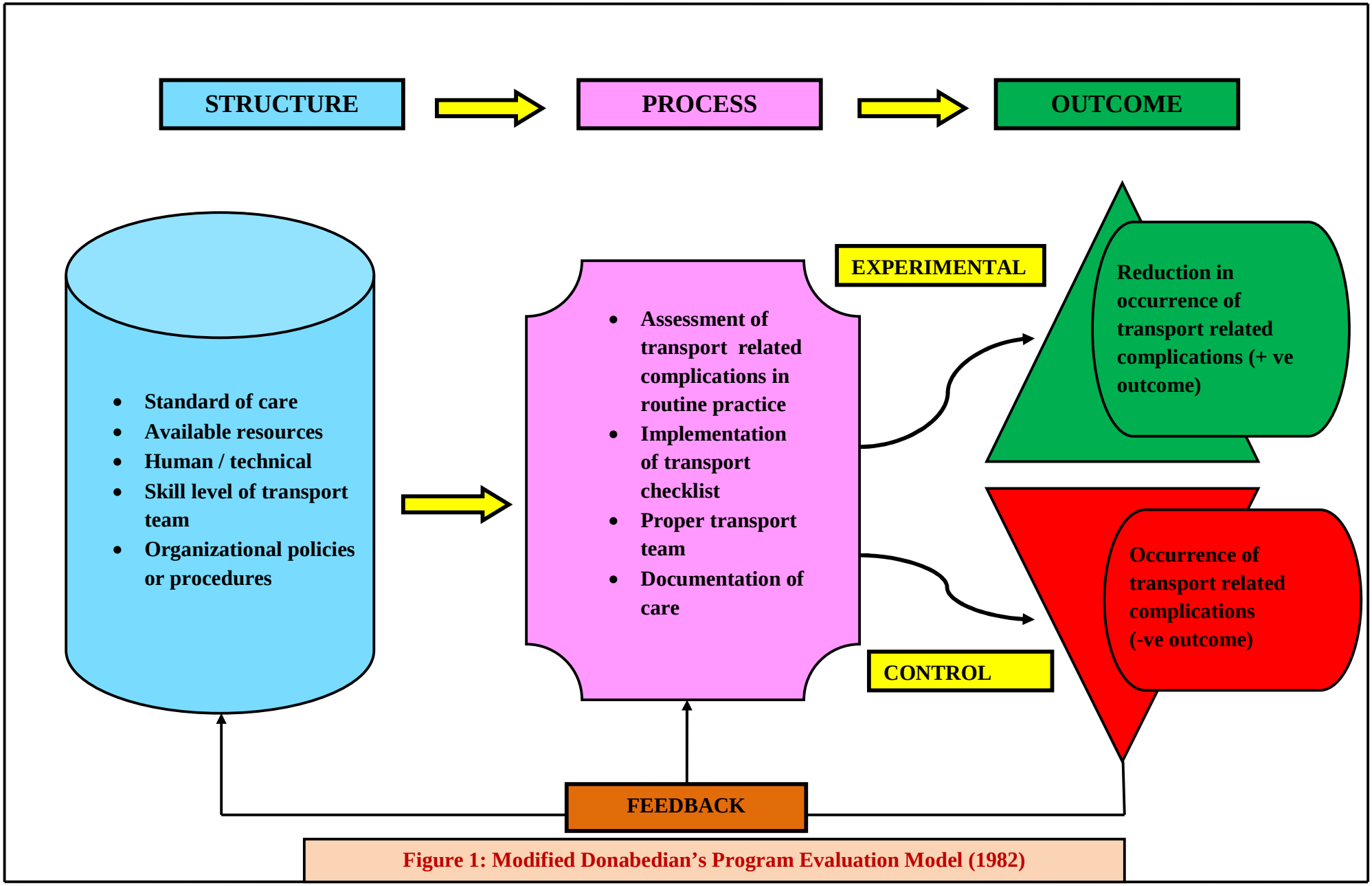


Figure 1: Modified Donabedian's Program Evaluation Model (1982)

CHAPTER II

REVIEW OF LITERATURE

This chapter deals with the information gathered from various research articles and unpublished thesis, related to present study. Indian literatures on transport of critically ill patients are very few. Literature review helps the researcher to strengthen the present study by laying a better foundation and also to mould the study for the best outcome. The review of literature for the present study is categorized as follows:

1) Incidence and risk factors of intra hospital transportation of critically ill patients.
2) Preventive measures to reduce intra hospital transport related complications among critically ill patients.
3) Occurrence of complications associated with intra hospital transport of critically ill patients.

a) Literature related to incidences and risk factors of intra hospital transportation of critically ill patients:

A study was conducted to investigate the incidences of adverse events and risk factors during intra hospital transport of critically ill patients in China. A prospective multicenter observational study in 34 intensive care units, which was subdivided as three parts: pre transport, during transport and post transport. They have enrolled the patients acute physiology and chronic health evaluation scores, Glasgow coma scale, vital signs, arterial blood gas analysis , bicarbonate levels, lactate levels, glucose levels were reviewed during the pre transport and post transport periods. From 441 intra hospital transports 369 critically ill patients were analyzed. Adverse events were classified into equipment related incidents and patient related incidents. The overall incidence of adverse events were 79.8%. In this 7.9% was equipment related and 79.4% were patient related incidents. The possible risk factors were patient characteristics such as age, sex weight. ICU admission type, clinical characteristics before transport such as APACHE II score, Glasgow coma scale, artificial airway, ventilation, number of catheters, arterial blood gas analysis findings, lactate level, glucose level, vital signs, transport

characteristics like analgesia, sedation, vasoactive drug support, emergency transport, night transport, multiple intra hospital transport of one patient, transport duration. (Jia, et.al, 2016).

Decrucq, et.al, (2013) evaluated the incidence and risk factors for occurrence of adverse events during intra hospital transport of critically ill patients. A prospective observational study among 38 bed medical ICU was conducted in France from 2009 to 2010. All mechanically ventilated who are in need of intra hospital transport for computerized tomography were enrolled. Total 262 transports observed 120 were associated with adverse events. Identified risk factors were ventilation with positive end expiratory pressure >6cmH_2O, sedation before transport and fluid loading for intra hospital transports. Out of these events 68 (26%) of all intra hospital transports were associated with adverse events affecting patients. The identified risk factors were positive end expiratory pressure >6cmH_2O and treatment modification before transport. Adverse events caused seriousness for the 44 patients. In this study adverse events did not statistically increase ventilator associated pneumonia. The study concluded that the intra hopsital transport of critically ill patients lead to a significant number of adverse events.

b) Literature related to preventive measures to reduce intra hospital transport related complications among critically ill patient

Prospective study has done among the patients admitted in Intensive care unit of a hospital in Triangulo Mineiro region based on two strategies. About 103 transports were monitored and accompanied with the transport team. The first strategy for method of data collection was non participatory observation with the application of an instrument titled “observation script” and the second strategy was undertaking the integrative review. Script included the patient data and data collected during the preparation, move and return of the patient who underwent intra hospital transport. The study results in the first stage , non participant observation, the incidents which occurred were related to equipment and patient. It could be minimized through challenging health acre professional involved in the task. The second stage: selected the integrative review in accordance with objective, method and results. The selected studies

recommends that intra hospital transport should be undertaken by a specialized team with adequate knowledge and skill. The studies also emphasize that evaluation of patient using protocols and guidelines are fundamental. The third stage represents organization of the script for evaluation of the patient for intra hospital transport. Study suggests that effectiveness of present script for evaluating patients for intra hospital transport for the safety of patient. (Silva & Amante 2015)

A study announced about the adverse effects happened during transport and also the preventive measure to reduce the adverse events related to transport. Adverse events occured in almost 70% of transports. It includes change in heart rate, arterial hypotension and hypertension, increased intracranial pressure , arrhythmias, cardiac arrest and a change in respiratory rate, hypocapnia and hypercapnia and hypoxemia. About one third of cases adverse events were equipment related. Long deterioration of respiratory function was observed in about 12% cases. Risk factors related to patient were found to be high therapeutic intervention severity score, mechanical ventilation, ventilation with positive end expiratory pressure and high injury severity score. About 40-50% of cases had a change in patient management which indicate a good risk benefit ratio. The study concludes that the usage of transport guidelines as, an efficient transport team and specially constructed carts will reduce the mishaps during transport of critically ill patient. (Waydhas 1999)

The study illustrated about the use of ventilator and monitoring equipment, as well as a multiprofessional team composed of a doctor, a nurse and a respiratory therapist for transportation of critically ill patient. Total 37 transfers of 26 patients were studied from a 21 beded general ICU in a teritiary university hospital at Brazil. They analyzed the pre and post transport hemodynamic and respiratory parameters of the patient. Complications occurred were 32.4%. The complications analysed were hypoxemias, accidental disconnection, hypotension and agitation. The result that imposing high standards in transportation and a multiprofessional team, together with high quality equipment, can help to reduce transportation associated morbidity and mortality. **(**Mazza 2008).

The study comprised of the development of practice guidelines for inter and intra hospital transport of critically ill patients. The data source were obtained from expert opinion and index medicus. They extracted several prospective , clinical outcome studies, retrospective reviews and anecdotal reports. The guidelines says that each hospital should have a formalized plan for intra and inter hospital transport. They address the pre transport coordination and communication, transport personnel, transport equipment, monitoring during transport and documentation. It should be developed by a multidisciplinary team and should be evaluated regularly. Proper assessment of patient risk factors and benefits from transport, efficient process supported by appropriate equipment and personnel were warranted. (Warren 2004).

The study highlighted to review the risk factors for complications and to focus on the contribution of nurse in intra hospital transport policies, to prevent complications. The risk factors for complications are related to patients severity of illness, equipment and malfunction of devices, poor communication between staff that prepare and accompany the patient, inadequate monitoring of patient during transport and insufficient documentation of intra hospital transport procedure. Nurse should be aware about the risk factors for complications and how to avoid the occurrence of unexpected outcomes. The harmless critical incidents put patient's life at risk. Nurse has an important role in each and every part of intra hospital transport. Organized and detailed plan for intra hospital transport procedure should be formulated.. The study concluded that well designed transport protocol which includes proper decision making, intra hospital transport policy, transport personnel, equipment, preparation and intra hospital transport procedures and evaluation could minimize the complications.. Evaluation helps in identifying problems within the system, deficiencies in training, human errors and unpredictable risk factors of transport. It helps in further implementation of protocol as expected. (Alamanou, et.al, 2014).

The current study was using checklist for intrafacility transport of adult intensive care patients. The incidence on adverse events during intrafacility transport ranged from 1.7% to 75.7%. In 2006, staffs at university of Texas Medical Branch identified opportunities for improvement in patient safety during intrafacility transport of adult

ICU patients. Assessed the adverse events in 4 adult ICU and developed a transport checklist which included the required equipment, preparing the mechanical ventilator, items to complete transport. The checklist which includes instructions for nurses and respiratory therapist before transport, and a section at bottom has to be completed once they have arrive at the procedural area. The second page is the patient screening tool. The checklist was implemented in each intrafacility transport, nurse, respiratory therapist and clinician were asked to fill out the checklist. 2506 transports were conducted 97.6% reported no complications. Only 2.4% of transports were reported with complications. The study suggested implementation of checklist for bedside clinicians are suitable for preparing transport. (Comeau, et.al, 2015).

The study offers recommendations for safe intra hospital transport. The possible mishaps were explained on the basis of system based mishaps, patient based mishaps, adverse events from mishaps. Equipment related mishaps were monitor power failure, ventilator disconnection or failure, depleted oxygen supply, oxygen saturation, probe failure, tubing tangles, and electrocardiography lead disconnection. Staff related mishaps were gaps in monitoring, missed treatments or medications, unintended extubation, underventilation, overventilation, loss of chest tube, under or overresuscitation, loss of intravenous access or arterial catheter and loss of intracranial pressure monitor or ventriculostomy. Patient related mishaps were aspiration, derecruitment, increased oxygen consumption , desaturation, arrhythmias, hypotensive or hypertensive, hypothermia, agitation or pain. In organizing the safe transport uses 5- Ws approach.. that is why, who, what, when, where. ‘Why’ indicates the need for transport with proper assessment of need, risk and benefits of transport, whether any bedside alternative available to avoid the transport . ‘Who’ indicates the patient and personnel, current patient care requirement insists transport personnel to accompany the transport. ‘What’ indicates the requirements of equipment , level of monitoring, ongoing intervention . ‘When’ indicates the time means ongoing procedure, optimal timing of the procedure, timing of medications required before procedure. ‘Where’ indicates the destination of transport which need proper selection of best route for transport,

availability of special safety requirements. This study helps to minimize ICU nurses to minimize the risks of transport. (Day 2010).

Jarden & Quirke (2010) describe that the development of an intra hospital transport tool for critically ill patients improves documentation and safety in transport. The study was conducted in a 14 bed general ICU in New Zealand. In 2008 they conducted a pilot study and evaluated the number and outcome of patients and also reviewed the events related to intra hospital transports. The transport tool was concise which encompasses four key areas of transport process: preparation, assessment, monitoring and documentation. The tool covers the pre transport preparation checklist, patient assessment form, a observation chart, and section for documentation of transport complications, and a reminder to recheck equipment and oxygen. The ICU nurses use this transport tool while transporting their patients out of ICU. The tool benefit in enhancing patient outcomes through safer ICU intra hospital processes.

Berude, et.al, (2013) conducted a study in a 24 bed ICU of a teritiary care medical centre. The study design was prospective pre and post intervention design. The first part of the study was observational (pre implementation) and the second part of the study included implementation of an improvement tool (post implementation). The objective of the study was to determine an interdisciplinary preventive programme used by all intensive care unit team members involved in patients transport on the rate of these incidents. Total of 180 transports occurred in the pre implementation phase of the study and 187 transports in the post implementation phase. A 20% absolute reduction of incidents were observed. Statistically significant reductions were obtained for the technical problems as well as the problems related to patient mobilization. Clinically significant trends were also observed for the clinical deterioration and undesired delay before test categories but did not reach statistical significance. The study suggests that implementation of a simple preventive programme reduced the incidents related to transportation of critically ill patients and established a continuous improvement of transport safety for critically ill patients.

A study was conducted in Italy to create a tool to standardize the intra hospital transport of critically ill patient to reduce risks and monitor adverse events. The guidelines by the Italian society of Analgesia Resuscitation and Intensive care was used to prepare the tool. They have collected 54 checklists. The main adverse events were related to clinical deterioration, technical issues and problems within the team. The most common complications affected mobilization (42.59%) and clinical worsening (37.04%). The study results that careful preparation of the patient and a good coordination among operators reduce the occurrence of accidents. They suggested that each hospital should have an internal protocol for transport. The checklist was useful and easy to compile for the standardization of the procedure. It helps in planning the transport and reduce possible adverse events. (Elli, et.al 2013).

A study was conducted in university of Missouri Hospitals and clinics which is a 375 bedded level 1 trauma center. This institution developed a specially trained group of ICU nurses to assist with the transportation, monitoring and stabilization of ICU patients undergoing specialized procedures. Total 237 ICU patients was evaluated. 7% of patients experienced single aberrations in the form of minor elevations in vital signs. And an additional of 4% experienced single incidents in the form of minor elevation of vital signs. 3% of patients had a moderate elevation in blood pressure in association with their radiological examinations. A total of 3% patients had severe complications. 2% had major elevations in blood pressure. The study suggests that using a specially trained ICU nurses to transport patients for specialized radiological procedures can minimize the known risks of intra hospital transportation. (Stearly 1998).

Lucchini, et.al, (2012) evaluated the benefits of a new transport system for critically ill patients. The study was the standardization of procedures for the transport of critically ill patients in intensive care: observational study of 68 intra hospital transport. The system is based on the use of X-ray compatible table combined with a support structure for electrical equipment placed over the patient's legs and fixed to the table itself. The method used was an observational study on 50 invasive ventilated ICU patients, subjected to 68 in =-hospital transports to the X-ray department. Haemodynamic instability occurred in 7 transports (9.4%), and respiratory instability occurred in 3

transports (4%). The study concluded that the adoption of standardization procedures and the use of a transport system “plug and play” allows to transport critically ill patients, potentially reducing complications caused by moving and handling.

c) Literature related to occurrence of complications associated with intra hospital transport of critically ill patients.

Bambi, et.al, (2015) explored the complications among critically ill adult patients during intra and inter hospital transports. Intra hospital transports are affected by adverse events ranging from 22.2 to 75.7%. Adverse events during inter hospital transport was upto maximum of 34%. Intra hospital transported related complications was based on equipment related, personnel related incident and adverse events. The risk factors for development of adverse events are equipment related, transport team related, coordination and organization related and patient related risk factors. Inter hospital transport were performed by ambulance (63%), airplane (17%), helicopter (20%).Complications related to inter hospital transport was based on clinical condition, gas supply, ambulance electric system, equipment and electric supplied trolley, leakages from gas supply, dysfunctional gas tube connectors, blown fuses, minor defects on doors and electrical or mechanical damages to the trolley. Problems identified in inter hospital transport of extracorporeal membrane oxygenation life support patients were related to power supply, components of the extracorporeal circuit and vehicles. And also technical problems were occurred to ECMO/ECLS during transport.

Kue, et.al, (2011) conducted study to assess the occurrence of adverse clinical events during intra hospital transport done by a specialized team. Study was done in state of Maryland, the hospital has a 122 ICU beds. Around 3383 intra hospital transports of adult patients were reviewed retrospectively (91.8% of all completed transports). The total rate of adverse events was 1.7%. most of the events were related to hypoxia (25/59) and blood pressure changes (25/59). One extubation and one code team activation noted. Interventions involved are adjustment in oxygen therapy, vasopressor management. 12 of the transport were abortion due to patient condition severity. It suggested that the rate of

clinically significant adverse events during transport by a specialized team was relatively low.

This study contributed the literature regarding complications related to staff, equipment and physiological factors during intra hospital transport of critically ill patients. The objective of the study was to identify the literature on complications related to physiological changes of the patient with multidisciplinary team and use of equipment during intra hospital transport of critically ill patients. They collected the integrative reviews from PubMED, MEDLINE, and LILACS. The study results that total 20 articles were as per the inclusion criteria. The changes in the arterial blood pressure and heart rate was most common. The rate of adverse events ranged from 30% to 70% of all cases of intra hospital transportation. Also events related to patients physiological alterations, problems in the multi disciplinary team involved in the transport, inter staff communication and equipment failure were frequently observed. Study suggests that usage of transport protocols, identifying opportunities to obtain excellence in service during transport enhances communication between teams and standardize the actions and equipment for transporting the critically patients safety. (Almeida, et.al, 2012).

The study describes the occurrence of cardiorespiratory repercussions and to identify adverse events during intra hospital transport of patients on invasive ventilation. They conducted a prospective observational non randomized study in a tertiary hospital at sao Paulo. They included 48 ventilated patients who required intra hospital transport. Before and after transport of patients they evaluated blood gas analysis , vital signs, use of medications by means of continuous infusion pump, parameters regarding the mechanical ventilator, duration of transport, transport distance and number of professionals involved in transport. Cardiorespiratory alterations were identified in 39 transport, 16 adverse events related to equipment such as problems with batteries and miscommunication. The study concluded that during intra hospital transport of patients on invasive ventilation 67.2% had cardiorespiratory alternations and 75.7% had adverse events related to transports. (Zuchelo, et.al, 2009).

Papson & Russell (2007) contributed about the occurrence of unexpected events during the intra hospital transport of critically ill patients. They conducted a prospective

observational study of consecutive intra hospital transports in a major trauma referral center between March 2003 and June 2004. All the emergency physician were trained in Emergency transport policy. The physician usually escort the transport of critically ill patient along with the nurse and recorded all data during or immediately after the transport. The data include equipment – related unexpected events, patient instability and invasive line related unexpected events, whether the unexpected required intervention, and whether the unexpected events were potentially life threatening. Total 339 transports were observed, 230 were associated with 604 unexpected events. There was 277 unexpected events related to equipment, 158 related to patient instability, 156 related to equipment lines and 13 were miscellaneous unexpected events. The study concluded that unexpected events during intra hospital transport of critically ill patients were associated with transporting physician experience. Therefore strict adherence to and review of existing transport guidelines was recommended to reduce the unexpected events.

This study investigated the patients complications during transportation to and from the ICU to a diagnostic or treatment site. Total thirty five critically ill patients from the neuro and trauma Intensive care unit were taken. The patients require continuous physiological monitoring and had an arterial catheter in place. The parameters such as systemic blood pressure, heart rate and peripheral oxygen saturation were monitored at nine time points throughout the transport process. The nine points were defined as: five minutes before the patient was prepared for transport, after the patient was prepared for transport but before the patient was transported off the unit, during the transport to the testing site, immediately upon arriving at the testing site, during diagnostic testing, immediately before leaving the testing area for return to the NTICU, during transport back to the NTICU, one minute after arriving back in the NTICU, thirty minutes after returning to the NTICU. The incidence of defined technical mishaps that occurred when the patient was out off the unit were recorded. And the transport factors examined included the length of time spent off the unit and the number and level of personnel accompanying the patient. Twenty three technical mishaps such as inadvertent ventilator, electrocardiogram disconnects, power failures, interruption of medication administration and disconnection of drainage devices were observed. The factors related to technical mishaps were the number of intravenous solutions and infusion pumps and the time spent

outside of the ICU environment. The study clearly demonstrated that greater the number of monitoring devices, greater the likelihood of experiencing technical mishap. Identification of this risk factor is critical because intra hospital transport protocols and standards of care can be developed and implemented to maintain physiologic homeostasis during this period. (Doring, et.al, 1999).

Meneguin, et.al, (2014) aimed to characterize the transport of critically ill patients in the intensive care unit of a teritiary public hospital. They have done a cross-sectional study in an intensive care unit for adults with 25 beds in a teritiary public hospital at Brazil. 459 intra hospital transports of critically ill patients were included. The data were collected from clinical records of patients and from a form with the description of the materials and equipment necessary for the procedure and description of adverse events and of the transport team. Out of 459 transports 262 were critically ill patients. Patients were on ventilatory support (41.3%) and 34.5% were with use of vasoactive drugs. Adverse events occurred in 9.4% of transports and 77.3% of the teams were composed of physicians, nurses, and nurse technicians. The study concluded that transport occurred in the morning period to undergo CT scan, and patient depended on ventilator support and vasoactive drugs. All the equipments used during transport was in working order and the adverse events were attributed to clinical changes in patients.

Beckmann, et.al, (2004) done an analysis on incidents relating to the intra hospital transfer of critically ill patients. They did a cross-sectional case review. Incident reports submitted to the Australian Incident Monitoring Study in Intensive Care. Between 1993 and 1999, around 176 reports were submitted describing 191 incidents. 75 reports (39%) identified equipment problems, relating prominently to battery/power supply, transport ventilator and monitor function and access to patient elevators and intubation equipment. 116 reports (61%) were identified due to patient/ staff management issues including poor communication, inadequate monitoring, incorrect set-up of equipment, artificial airway malpositioning and incorrect positioning of patients. Serious adverse outcomes occurred in 55 reports (31%) including major physiological derangement (15%), patient/relative dissatisfaction (7%), prolonged hospital stay (4%), physical/psychological injury (3%) and death (2%). Out of 900 contributing factors identified, 46% were system based and

54% human based. The study concluded that adequate provision of highly qualified staff, well maintained equipment as well as continuous monitoring as essential to avoid/mitigate these incidents. Adoption of guidelines/ protocols for intra hospital transportation of critically ill patient aid in continuous improvement in patient safety.

Lovell, et.al, (2001) done an audit to assess the complications and difficulties in intra hospital transport of critically ill patients. An audit of 97 intra hospital transports of critically ill patients was done at Westmead hospital. The audit aims at identifying the factors that may lead to problems during intra hospital transports. At the completion of the transport medical staff were asked to provide information about their patient and their treatment, as well as any difficulties they may have encountered. Overall 62% of transports reported some complications. Of these, 31% were patient related and 45% were related to equipment or the transport environment. 15% were encountered in both patient related and equipment related. Many of these difficulties were preventable with adequate pre transport communication and proper planning. Other complications were related to increasing severity of illness in these patients. Through this prospective audit they have formulated a protocol for intra hospital transports to avoid difficulties during transport.

Jereb, et.al, (2015) performed a descriptive research method to review previous research guidelines. The data was retrieved from pubmed database, google search engine and cooperative bibliographic/catalogue database. The study demonstrated the adverse events associated with the transport, and the procedure that can reduce their incidence. The study results that the most important risk factors for complications linked to patient transport are considered in the selected research. The studies included can be compared in the terms of incidence of the most common complications and solution planning, but in terms of the number of patients involved. The study suggests that in spite of differences in the nature of complications, the results are comparable. The common equipment related adverse events could be prevented by taking appropriate measures. The risk of complications was increased by non compliance to the adopted guidelines for intra hospital transport.

Ellison & Richard (2006) suggested that intra hospital transport triples the risk for ventilator associated pneumonia in critically ill mechanically ventilated patients. Many risk factors for Ventilator associated pneumonia has been identified. Many researchers assessed whether within hospital transportation for diagnostic or therapeutic procedures increases risk for ventilated associated pneumonia among mechanically ventilated patients. The study was conducted in a 18 bedded Medical surgical ICU in France. Out of 523 patients who were mechanically ventilated for more than 48 hours, 228 were transported outside the ICU. Through a matching process that involved six factors including durations of mechanical ventilation and antibiotic therapy before development of ventilator associated pneumonia, 118 transported / non transported patients were paired. The ventilator associated pneumonia rate was significantly higher in transported than non transported patients (26% Vs 10%). Multivariate analysis identified intra hospital transport as a risk factor for ventilator associated pneumonia (odds ratio, 2.9; 95% confidence interval, 1.4-5.7). The study suggests that clinicians should watch closely for ventilator associated pneumonia in patients who have undergone transport while on mechanical ventilation.

Bercault, et.al, (2005) evaluated the impact of intra hospital transport of critically ill ventilated patients on the acquisition of ventilator associated pneumonia. It was a exposed / unexposed matched cohort study. It was conducted in 18 bedded medical and surgical intensive care unit in France. The matching process was according to six criteria: duration of mechanical ventilation, duration of antibiotic therapy, indication for ventilator support, age, probability of death and surgical procedures or not during intensive care unit stay. The ventilator associated pneumonia rate was 26% in exposed patients compared with 10% in the matched unexposed patients. Two factors were independently associated with ventilator associated pneumonia: intra hospital transport (odds ratio, 3.1; 95% confidence interval, 1.4-6.7) and need for reintubation. The study concluded that intra hospital transport appeared to be a significant risk factor for ventilator associated pneumonia.

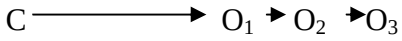
CHAPTER – III

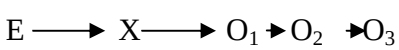
METHODOLOGY

This chapter deals with methodology by which the researcher assessed the effectiveness of modified intra-hospital transport checklist in reducing the transport related complications among critically ill patients. It consist of research design, variables of the study, setting of the study, population of the study, sample size, sampling technique, criteria for sample selection, description of the intervention, development of checklist, development and description of the tool, pilot study, reliability and procedure for data collection.

RESEARCH DESIGN

The research design for the study was quasi experimental non equivalent control group post only design involving manipulation and control. At the start of the study to prevent contamination effect 50 samples were allocated to control group. Followed that training session on modified intra hospital transport checklist was conducted. Subsequent 50 samples were allocated to experimental group.





E- Experimental group

C- Control group

X- Implementation of modified intra-hospital transport checklist

O_1- Pre transport assessment

O_2- During transport assessment

O_3- Post transport assessment

VARIABLES UNDER THE STUDY

In this study, the modified intra-hospital transport checklist were the independent variable and transport related complications were the dependent variables.

SETTING OF THE STUDY

This study was conducted in KMCH Coimbatore. It is a 850 bedded multispeciality hospital, having advanced facilities. The Medical and Surgical Intensive Care Unit comprises of 50 beds and equipped with latest gadgets.

POPULATION OF THE STUDY

The population for the study included all the critically ill patients who were undergoing intra-hospital transportation during their ICU stay.

SAMPLE SIZE

The sample size was 100, 50 intra hospital transports were observed after protocol implementation which were considered as experimental group and 50 intra hospital transports before modified intra hospital checklist implementation were observed which is considered as controls.

SAMPLING TECHNIQUE

Non probability purposive sampling technique was used for sample selection.

CRITERIA FOR SAMPLE SELECTION

Inclusion criteria

1) Intra hospital transfer of ICU patients during their ICU stay, such as to CTscan, MRIscan and Angiography.

2) Intra hospital transfer of ICU patients irrespective of their ventilatory support / inotropic support and underlying disease condition.

3) Intra hospital transfer of ICU patients irrespective of their age and gender.

Exclusion Criteria

1) All intra hospital transport of patients from ICU to wards.

2) All intra hospital transport from ICU to operation theatre.

DEVELOPMENT OF CHECKLIST

Based on the literature review, a modified checklist was used based on Intensive Care Department Leiden University Medical Center, Netherlands. Each component was phrased according to the present setting without deviating current evidences. The researcher developed this after discussion with the ICU team members and experts from Medical and Nursing field. The checklist was approved duly by the concerned Department Head and Ethics Committee, KMCH.

. The checklist covers patient profile, pre transport, during transport and post transport phases. Profile of the transport checklist includes patient demographic details, date of transport, time of start and arrival in ICU, purpose of the transport, type of transport, benefit of transport which outweigh the risk, accompanying transport team.

The pre transport phase is the broadest phase which require a mobile ICU set up. As per the facilities, the pre transport phase requires arrangement of equipments / materials as per patient and specifically in case of MRI. Setting up of trays and due medication requirements. Preparation of extra medication and intravenous fluids. Appropriate cardiac monitor setting and transport ventilator setting. Counter check battery charge for transport ventilator, monitor, syringe pump and laryngoscope. Communication and confirmation with primary consultant, attenders and concerned department. Notifications in case of CT scan with contrast. Extra care in handling drain tubes. Documentation of ET lip level and cuff pressure. Monitoring of patient vital signs at pre transport phase should be done prior to 15 minutes before the start of transport. The patient vital parameters in ICU monitor and equipments should be documented.

During transport phase comprises, to ensure the oxygen supply and power supply facilities at destination. Adequate visibility of monitor during procedure. Recheck all the connections and patient parameter before leaving the room (ABCDE) A- airway, B-

breathing, C-circulation, D-drugs and drain tubes, E-equipments. Documentation of any drugs and intravenous fluids administered during the time of transport. During transport phase every 15 minutes once documentation of vital signs and ventilator parameters if applicable.

The post transport phase includes the bedside connections with ventilation equipment, humidifier, patient monitor, stoppage of extra sedatives, untangle the pressure lines, restarting of ongoing infusions and enteral feeding and replacement of used things in the transport tray to keep the transport tray ready for next trip. The post transport vital signs should be documented after got connected with the ICU monitors and equipments. Finally, documentation of the procedure findings and issues in transport which helps in modifying the protocol.

DESCRIPTION OF INTERVENTION

The staff nurses and health team members were sensitized to the transport related complications and they were accustomed to usage of modified intra hospital transport checklist through small group training session. During each transfer the modified intra hospital transport checklist adherence was ensured by the investigator.

DEVELOPMENT AND DESCRIPTION OF THE TOOL

The investigator prepared the tool after going through the related literature and guidance of experts in the field of Nursing and Critical Care Medicine.

The tool for data collection is structured in three parts namely Part-I, Part-II and Part-III.

PART-I

Consists of two sub sections namely section-A and section-B.

SECTION- A

Consists of the background variables, including patient’s age and gender.

SECTION-B

Consists of clinical profile which includes underlying systemic disorder, number of personnel accompanied the transport, duration of absence from ICU, presence of inotropic support, mode of ventilation, transport destination, presence of drain tube.

PART-II

Observation checklist to assess the transport related complications. The observation checklist consist of the physiological monitoring of patient vital parameters such as heart rate, rhythm, respiratory rate, oxygen saturation, presence of supplemental oxygen, mode of oxygen delivery, blood pressure and mental status and temperature during pre-transport, during transport and post transport phases. From the above mentioned parameters the complications are classified into major, minor complications and miscellaneous issues. Each complication is given a score of 1 if present and 0 if absent.

PART III

Questionnaire to assess feasibility and usability of current checklist. It includes the time taken by the staff nurses to fill up the checklist in each phases and their user friendliness in using this checklist.

VALIDITY

The validity of the tool was established by submitting the observation checklist to the experts in the field of Medical Surgical Nursing as well as Medical experts. Based on their suggestions and recommendations, the main study was carried out.

RELIABILITY

After the pilot study, reliability of the tool was assessed by using Test retest method and its correlation coefficient ‘r’ value was 0.78 (major complications), 0.82 (minor complications) and 0.79 (miscellaneous issues). These correlation coefficients are very high and it is good tool to evaluate the effectiveness of Modified Intra Hospital

Transportation Checklist to reduce transport related complications among critically ill patients in Intensive Care Units.

PILOT STUDY

The pilot study was conducted in Medical and Surgical Intensive Care Units of KMCH, Coimbatore, to ascertain the feasibility of the study. Formal permission was obtained before pilot study. Pilot study has been conducted with 5 patients in each group.

PROCEDURE FOR DATA COLLECTION

Prior to data collection, necessary permission was obtained from concerned authorities and formal information was given to the incharges of the Medical and Surgical Intensive care units. The main study was conducted after ethical clearance from the ethical committee.

Data was collected from Medical and Surgical Intensive Care Units of Kovai Medical Center and Hospital, Coimbatore. Initially, data were collected from the control group. The control subjects were transported using existing routine practice as followed. Data was collected using participatory observation technique. The researcher accompanied the transport patients along with accompanying staff for transfer and observed the complications and patients parameters. Training session for the staff nurses on modified intra hospital transport checklist was taught after assessing control group complications. In experimental group the modified checklist were adopted by the accompanying nurse before the transport starts. The researcher monitored the time taken by the accompanying staff to fill the checklist in each phase. The researcher accompanied every transport alone with staff adopted the modified transport checklist. And the subjects were assessed for complications. After the transport, researcher administered a feasibility and usability questionnaire to get the nurses feedback about the checklist.

STATISTICAL ANALYSIS

The data collected were analyzed by means of descriptive statistics as percentage analysis and inferential statistics as two sample binomial proportion test was used to compare the complications in experimental and control group. Chi square test was used to know the homogeneity between two groups and to associate the variables and complications among experimental and control group.

CHAPTER IV

DATA ANALYSIS AND INTERPRETATION

This chapter deals with the analysis and interpretation of the data collected to evaluate the effectiveness of modified intra hospital transportation checklist in reducing the transport related complications among critically ill patients in intensive care units at KMCH, Coimbatore. The collected data were carefully coded and analyzed using SPSS package (20). The data obtained from 100 patients were analyzed and presented as follows.

ORGANIZATION OF DATA

Descriptive and inferential statistics were used for data analysis. Based on objectives of the study, the collected data were organized as follows.

Section A: Description of patients based on Demographic Variables.

Section B: Description of patients according to Clinical profile of subjects.

Section C: Description of frequency and nature of occurrence of transport related complication in Control group and Experimental group.

Section D: Comparison of complications in experimental and control group.

Section E: Association of demographic variables with complications.

SECTION A

DESCRIPTION OF SUBJECTS BASED ON DEMOGRAPHIC VARIABLES

TABLE 1: Distribution of subjects according to Demographic Variables N=100

S.No.	DEMOGRAPHIC VARIABLES		GROUP				SIGNIFICANCE
			Experimental Group (n=50		Control Group (n=50)		
			n	%	n	%	
1.	Age	18 - 40 yrs	20	40	11	22	χ^2=3.84 NS
		41 - 60 yrs	17	34	21	42	
		61 – 80 yrs	13	26	18	36	
2.	Sex	Male	31	62	34	68	χ^2=0.39 NS
		Female	19	38	16	32	

P< 0.05 NS – Non Significant

The table 1 shows that the distribution of subjects in experimental and control group according to age and sex. With respect to age, 40% (20) in experimental group in the age group of 18-40 years and 42% (21) in control group were in age group 41-60 years. Large proportions of subjects were men (68%) and only small proportion (32%) of the samples were women. There was no significant difference between control and experimental group based on demographic variables.

SECTION B

DESCRIPTION OF SUBJECTS ACCORDING TO CLINICAL VARIABLES

TABLE 2: Distribution of subjects according to clinical variables N=100

Clinical Variables		Experimental Group (n=50)		Control Group (n=50)		Significance
		n	%	N	%	
Underlying systemic disease	Neurologic disorder	15	30	25	50	χ^2=6.74 NS
	Respiratory disorder	3	6	5	10	
	Gastrointestinal disorder	4	8	1	2	
	Trauma	22	44	16	32	
	Others	6	12	3	6	
No. of personnel accompanying the transport	Nurse	8	16	11	22	χ^2=0.59 NS
	ICU Doctor, Nurse, Respiratory Therapist	2	4	2	4	
	Nurse, Respiratory Therapist	40	80	37	74	
Duration of transport	½ Hour	4	8	11	22	χ^2=8.57 NS
	½ - 1 Hour	36	72	30	60	
	1- 1 ½ Hour	2	4	6	12	
	1 ½ - 2 hour	7	14	2	4	
	>2 Hour	1	2	1	2	
Inotropic support	Yes	16	32	11	22	χ^2=1.26 NS
	No	34	68	39	78	
Mode of ventilation	Invasive ventilation	32	64	30	60	χ^2=2.78 NS
	Non invasive ventilation	10	20	16	32	
	Room air ventilation	8	16	4	8	
Transport Destination	CT Scan	38	76	43	86	χ^2=2.92 NS
	MRI Scan	8	16	6	12	
	Angiography	4	8	1	2	
Presence of drain tube	Yes	7	14	8	16	χ^2=0.07 NS
	No	43	86	42	84	

Table 2 depicts the distribution of subjects within two groups according to the clinical data. 50% of the subjects belonging to experimental group and 30% of the subjects belonging to control group were neurologic disorder patients. And 44% in experimental group and 32% in control group were trauma patients. Out of 50 samples, 40 transports were accompanied by nurse and respiratory therapist , 8 were accompanied by nurse alone. Among control group, 37 transports were accompanied by nurse and respiratory therapist, 11 were transported by nurse alone. Around 72% of transport took 1 hour duration in experimental group and 60% of transport took half an hour in control group. Among the subjects belonging to control group 22% had inotropic support and 32% in experimental group had inotropic support. On the basis of mode of ventilation 64% were in invasive ventilation and 30% were in non invasive ventilation. When the transport destination was asked 38 in experimental subjects and 43 in control subjects were shifted for computed tomography. 16% of subjects in control group and 14% of subjects in experimental group were shifted with drain tubes. Statistically there is no significant difference between experimental and control group in terms of clinical variables.

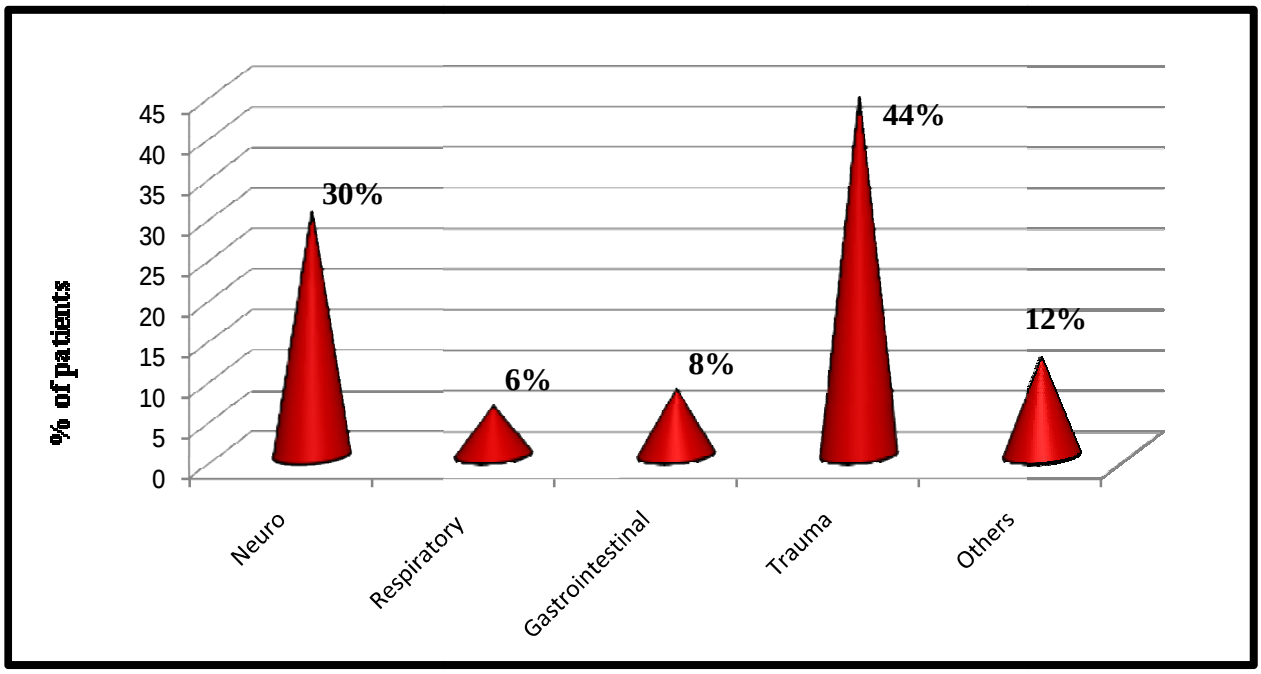


Figure 2: Distribution of subjects based on underlying clinical condition in experimental group.

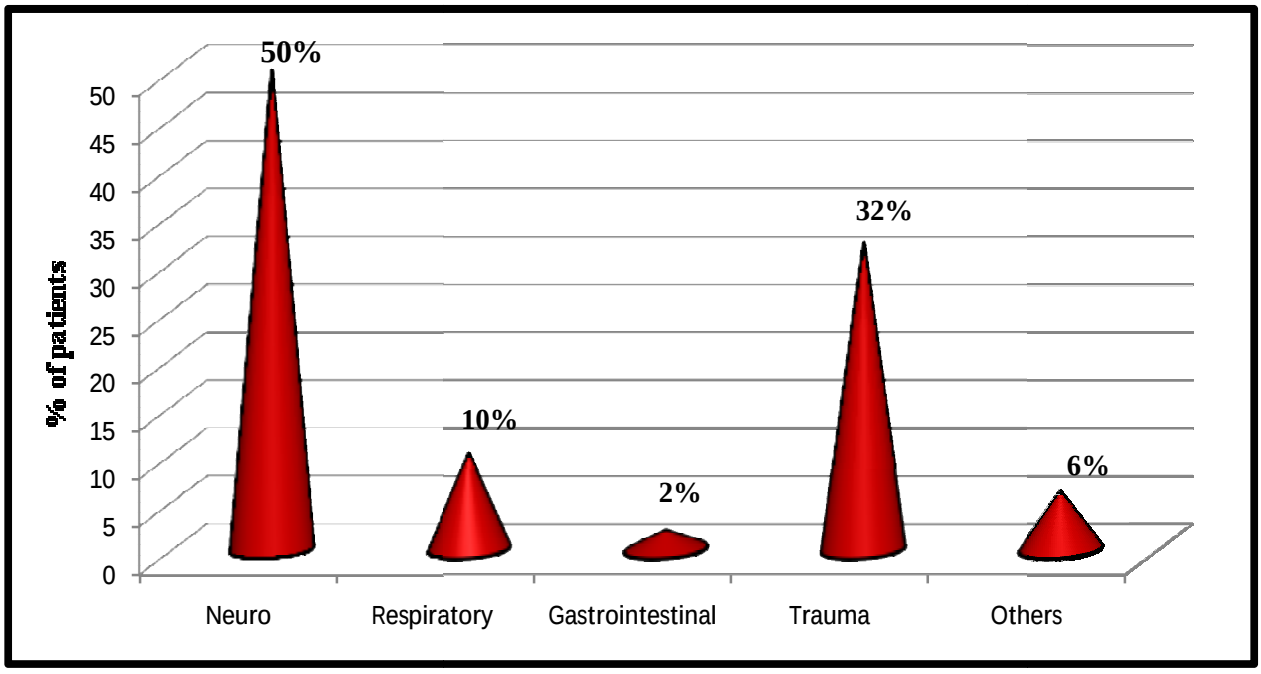


Figure 3: Distribution of subjects based on underlying clinical condition in control group.

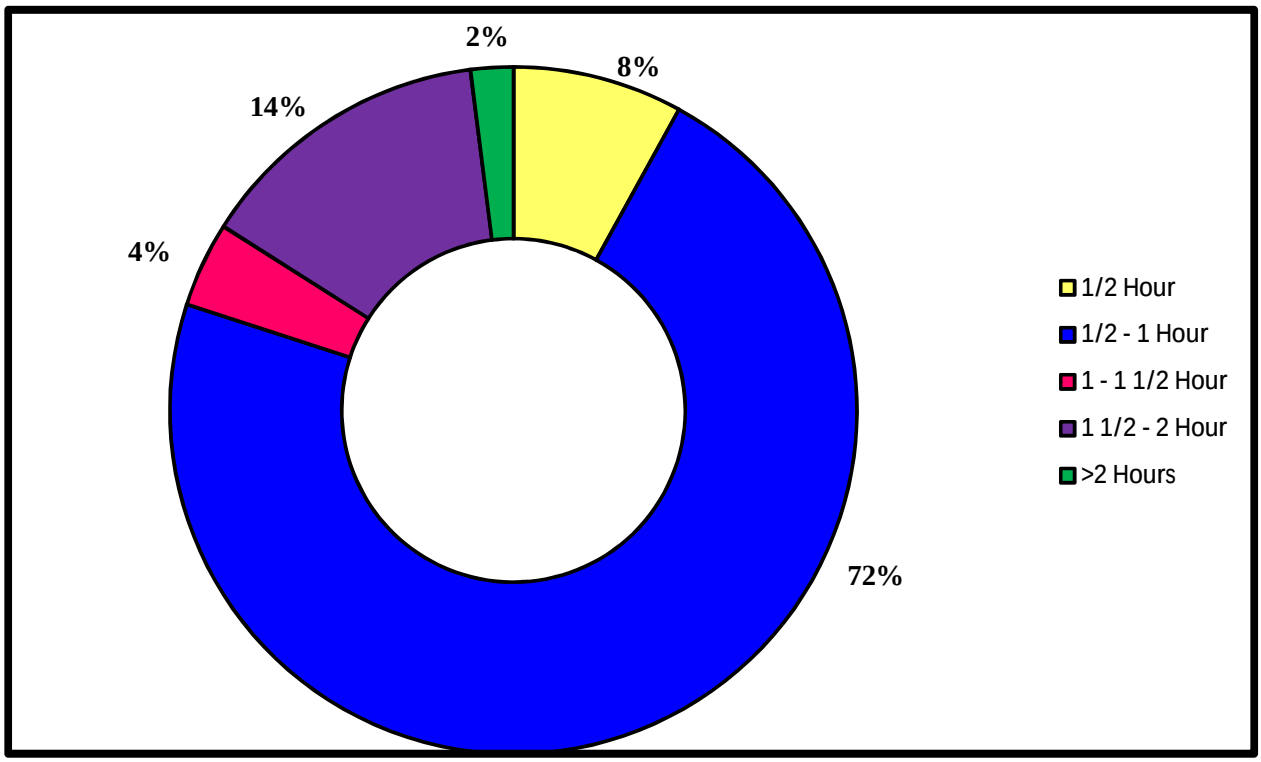


Figure 4: Distribution of subjects based on duration of transport in Experimental group.

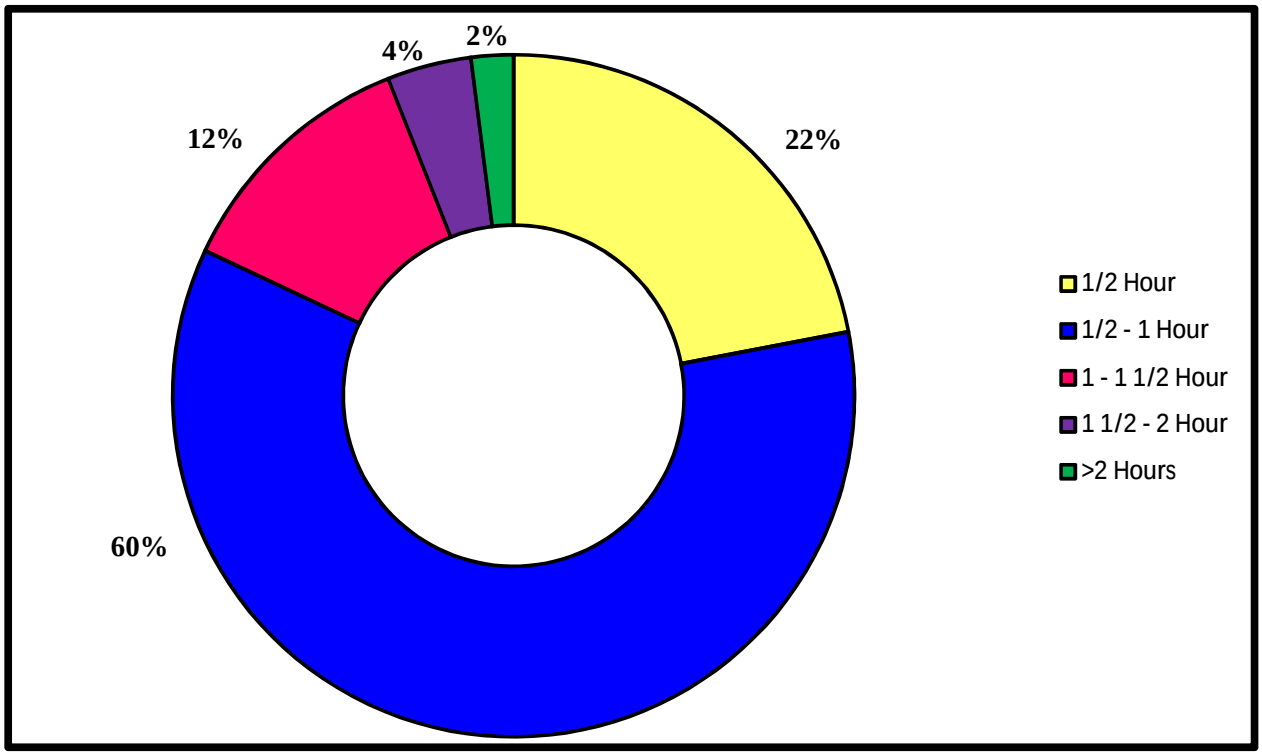


Figure 5: Distribution of subjects based on duration of transport in control group.

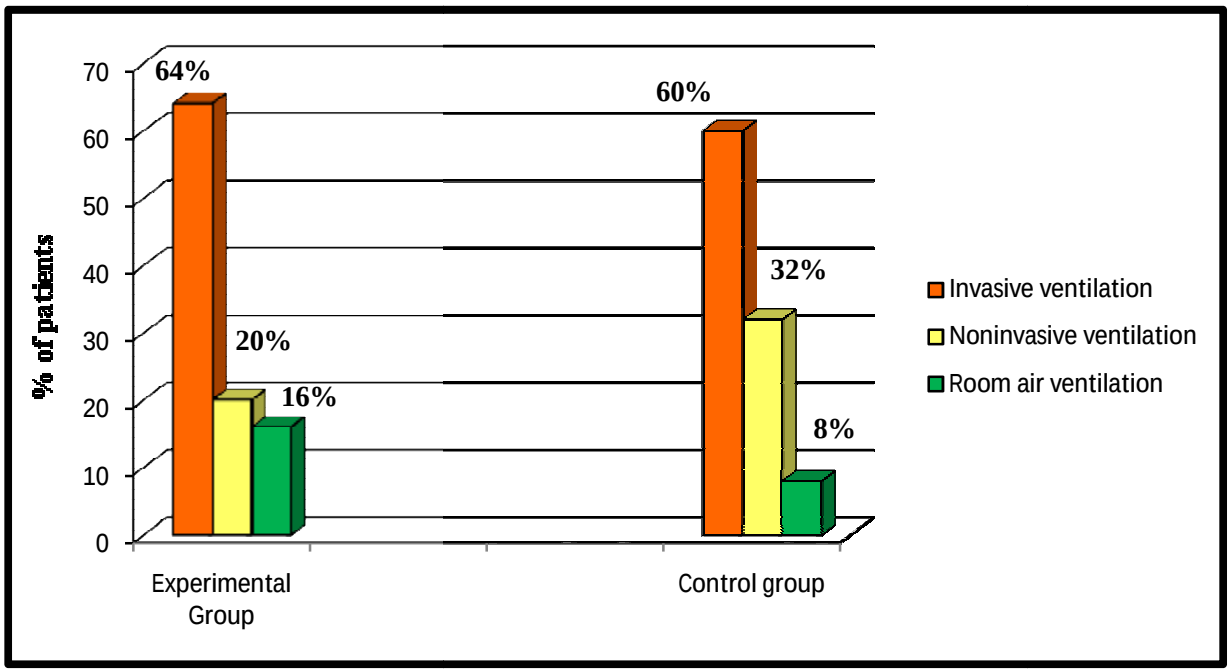


Figure 6: Distribution of subjects based on mode of ventilation in experimental and control group.

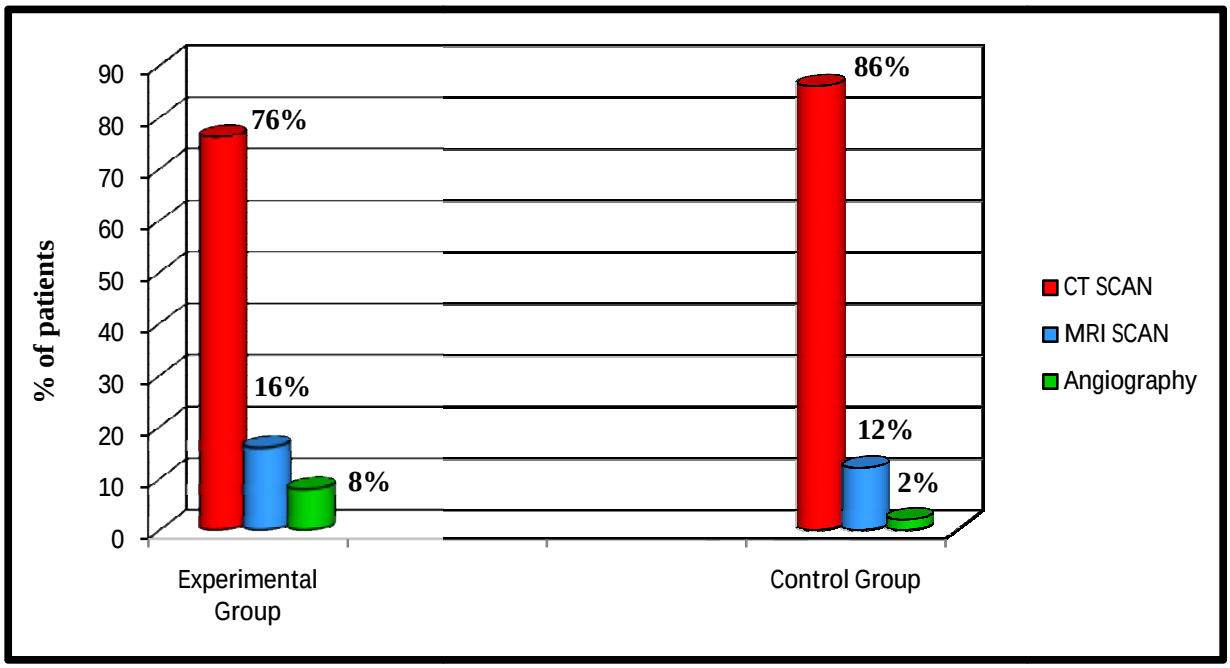


Figure 7: Distribution of subjects based on transport destination in experimental and control group.

SECTION C

DESCRIPTION OF FREQUENCY AND NATURE OF OCCURRENCE OF COMPLICATIONS AMONG EXPERIMENTAL GROUP AND CONTROL GROUP.

TABLE 3: Distribution of frequency of complications in experimental group and control group.

S.No.	COMPLICATIONS	EXPERIMENTAL GROUP (N=50)				CONTROL GROUP (N=50)			
		PRESENT		ABSENT		PRESENT		ABSENT	
		n	%	n	%	n	%	n	%
I. MAJOR COMPLICATIONS									
1.	Hypotensive event	0	0	50	100	2	4	48	96
2.	Arrhythmias	0	0	50	100	1	2	49	98
3.	Hypoxic event	1	2	49	98	11	22	39	78
4.	Cardiac arrest	0	0	50	100	2	4	48	96
II. MINOR COMPLICATIONS									
1.	Peripheral venous access disconnection/dislodgement / thrombosis	0	0	50	100	1	2	49	98
2.	Airway equipment disconnection	0	0	50	100	1	2	49	98
3.	Accidental disconnection of inotroph	0	0	50	100	1	2	49	98
III. MISCELLANEOUS ISSUES									
A.	**Preparedness and documentation issues**								
1.	Lack of preparedness for transport	0	0	50	100	10	20	40	80
2.	Lack of communication	0	0	50	100	1	2	49	98
3.	Lack of documentation	0	0	50	100	50	100	0	0
4.	Delay in receiving at destination for more than 10 minutes	1	2	49	98	5	10	45	90

B.	Ventilation equipment issues	PRESENT		ABSENT		PRESENT		ABSENT	
1.	Problems with alarms	1	2	49	98	1	2	49	98
2.	Transport ventilator failure	1	2	49	98	11	22	39	78
3.	Low battery	0	0	50	100	1	2	49	98
C.	**Oxygen source issues**								
1.	Near empty oxygen cylinder	0	0	50	100	1	2	49	98
2.	Oxygen cylinder not ON	0	0	50	100	4	8	46	92
3.	Failure in oxygen source at destination	0	0	50	100	3	6	47	94
D.	**Cardiac monitor issues**								
1.	Monitor failure	0	0	50	100	1	2	49	98
2.	Interference in monitoring	2	4	48	96	5	10	45	90
3.	Unsuitable screen display	0	0	50	100	7	14	43	86
4.	ECG lead disconnection	1	2	49	98	3	6	47	94
5.	Low Battery	0	0	50	100	2	4	48	96
E.	**Syringe pump issues**								
1.	Tubing tangles	0	0	50	100	6	12	44	88
2.	Failure to restart ongoing infusions after procedure	0	0	50	100	2	4	48	96

Table 3 illustrates the frequency of major, minor and miscellaneous complications in experimental and control group. 32% (16) had subjected to major complications like hypoxia, cardiac arrest, hypotension and arrhythmia in control group. Among this (22%) 11 samples had hypoxic event and (4%) 2 cardiac arrest. Major complications is significantly reduced in the experimental group. Majority of the minor complication occurred due to disconnection of airway equipment 2%(1), accidental disconnection of inotroph 2%(1), dislodgement of peripheral venous access 2%(1) in control group. Experimental group has a significant reduction in complications. The miscellaneous issues are mainly associated with equipments. Miscellaneous issues shows that all subjects in control group lack preparedness before transport 20% (10), lack documentation 100%(50). A predominant incidence in miscellaneous issues is identified

in control group. 13 issues were related to ventilation equipment , 8 issues were related to oxygen source, 18 comprises of cardiac monitor related issues and 8 shows issues related to syringe pump in control group. Experimental group shows a abundant decrease in occurrence of events as compared to control group events.

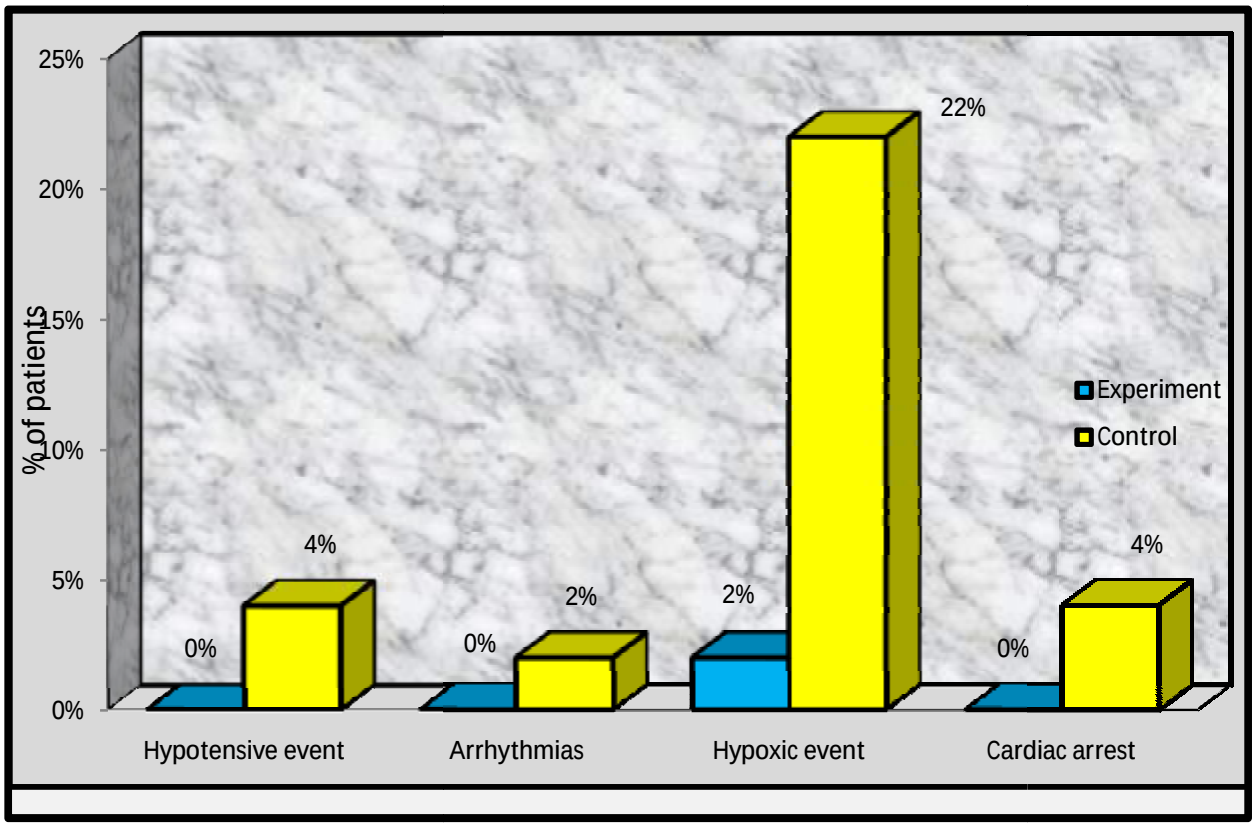


Figure 8: Distribution of subjects based on presence of major complication among experimental group and control group.

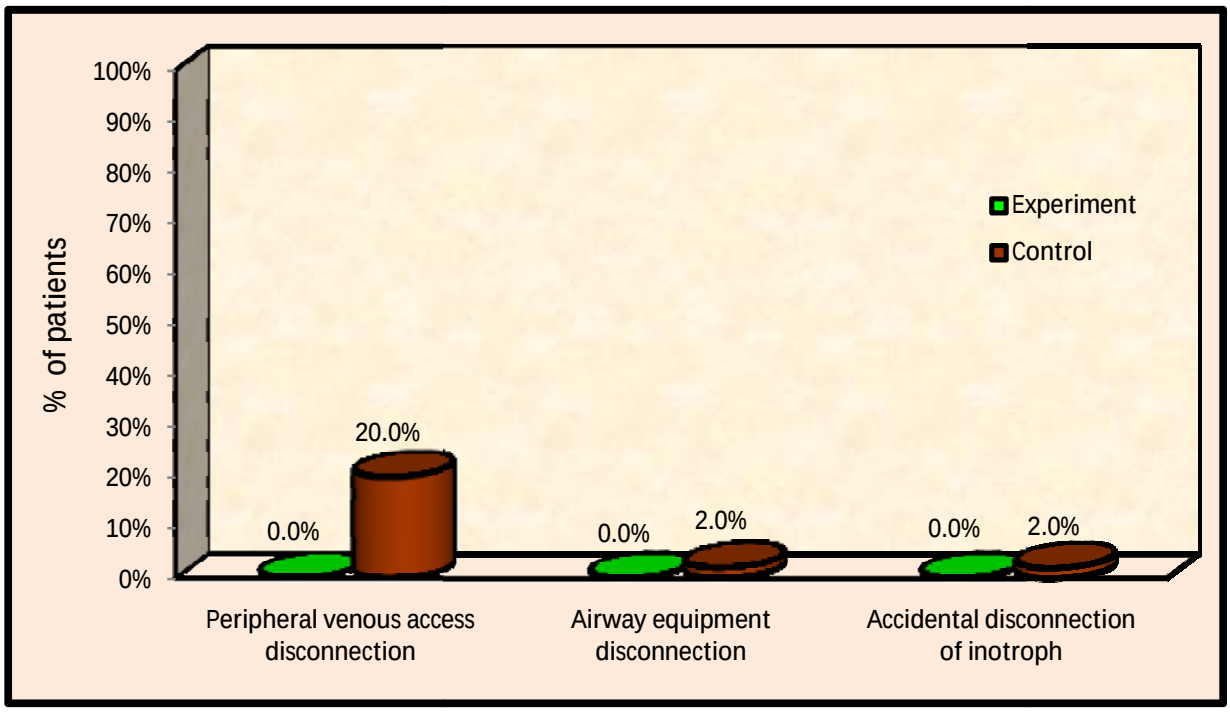


Figure 9: Distribution of subjects based on presence of minor complications among experimental and control group.

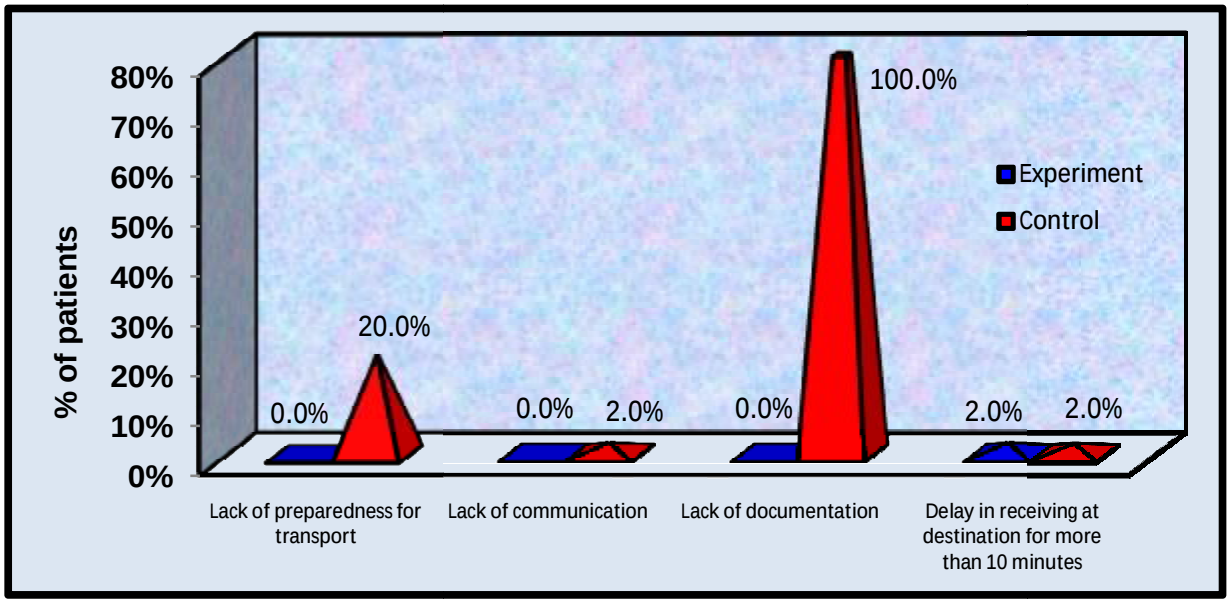


Figure 10: Distribution of subjects based on presence of communication and documentation issues in miscellaneous complications of both experimental and control group.

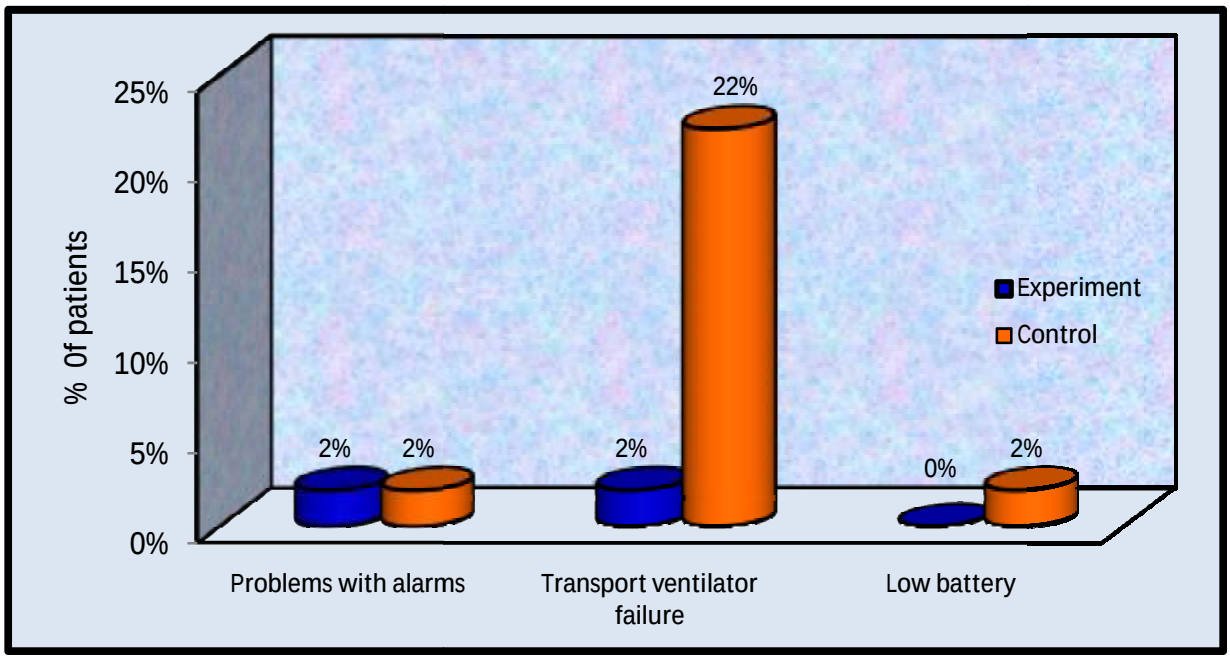


Figure 11: Distribution of subjects based on presence of ventilation equipment issues in miscellaneous complications of both experimental and control group.

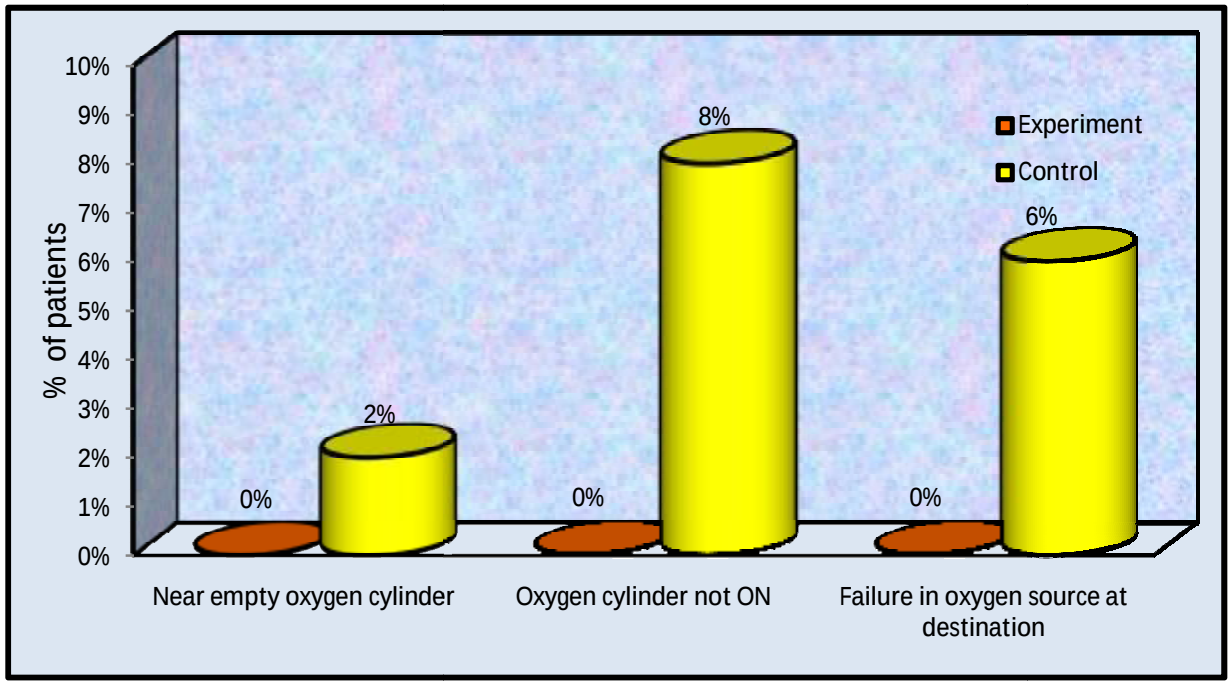


Figure 12: Distribution of subjects based on presence of oxygen source issues in miscellaneous complications of both experimental and control group.

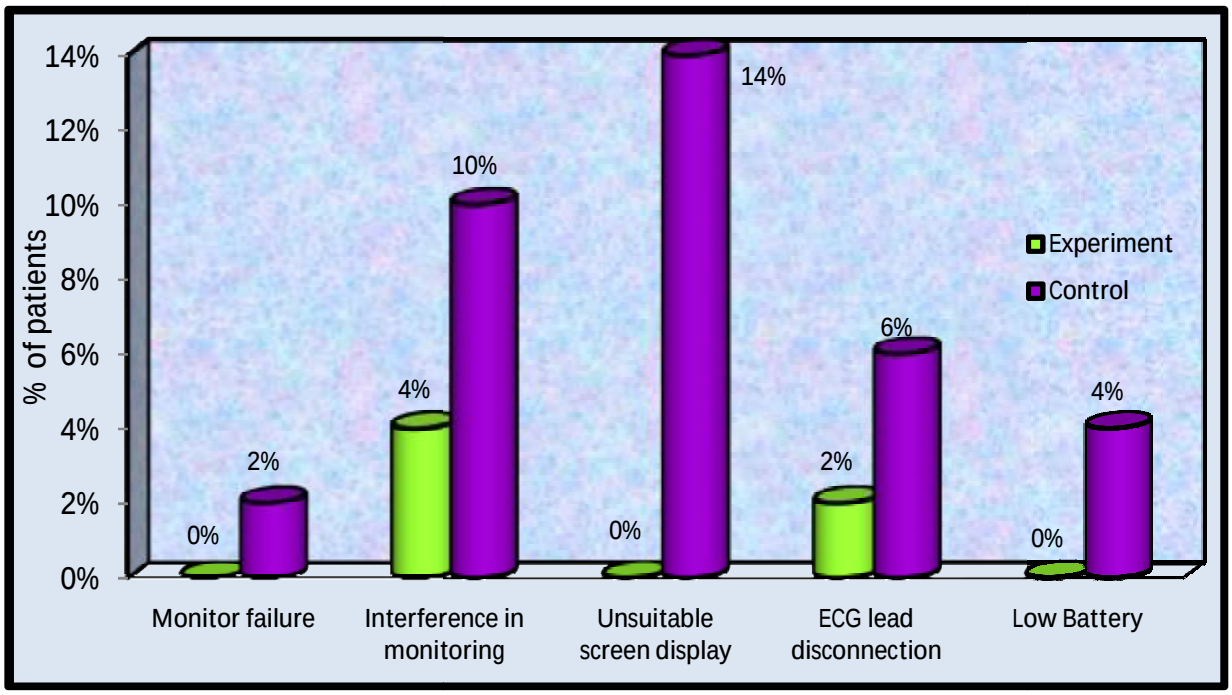


Figure 13: Distribution of subjects based on presence of cardiac monitor issues in miscellaneous complications of both experimental and control group.

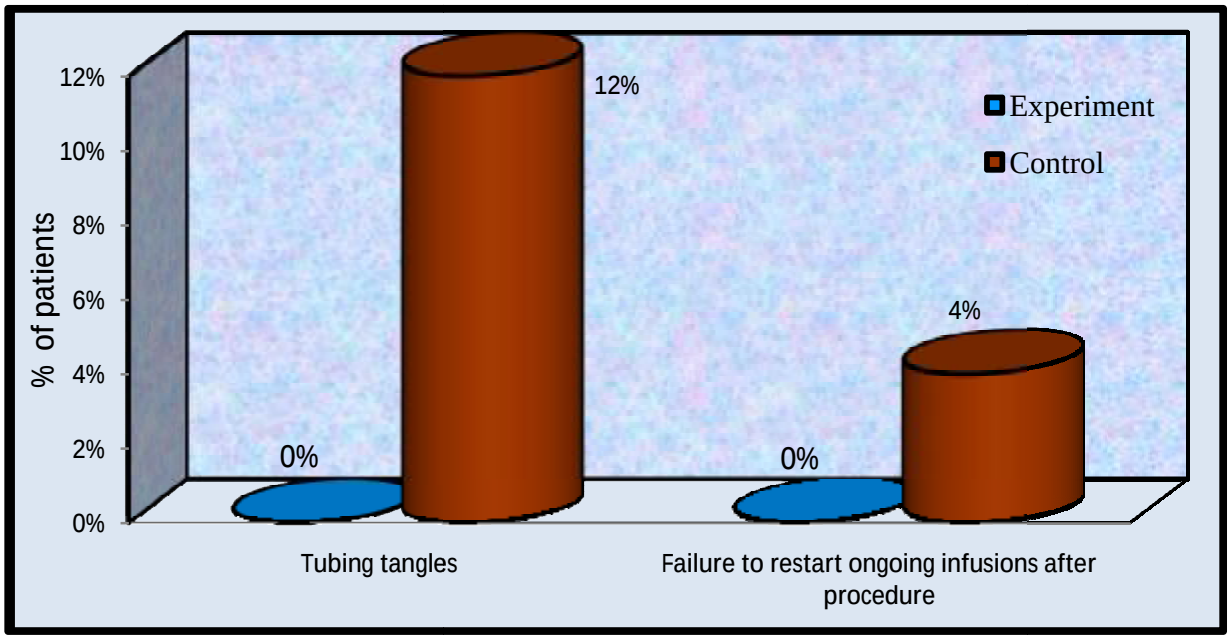


Figure 14: Distribution of subjects based on presence of syringe pumps issues in miscellaneous complications of both experimental and control group.

SECTION D

COMPARISON OF COMPLICATIONS IN EXPERIMENTAL AND CONTROL GROUP.

TABLE 4: Comparison of complications between experimental and control group.

S. No	COMPLICATIONS	Experimental group (n=50)	Control group (n=50)	PROPORTION TEST 'Z'
	I. MAJOR COMPLICATIONS	**n**	**n**	
1.	Hypotensive event	0	2	1.74 NS
2.	Arrhythmias	0	1	1.22 NS
3.	Hypoxic event	1	11	**3.07***
4.	Cardiac arrest	0	2	1.74 NS
II	**MINOR COMPLICATIONS**			
1.	Peripheral venous access disconnection/dislodgement / thrombosis	0	1	1.22 NS
2.	Airway equipment disconnection	0	1	1.22 NS
3.	Accidental disconnection of inotroph	0	1	1.22 NS
III	**MISCELLANEOUS ISSUES**			

A.	Preparedness and Documentation Issues	Experimental group (n=50)	Control group (n=50)	PROPORTION TEST 'Z'
1.	Lack of preparedness for transport	0	10	**4.01***
2.	Lack of communication	0	1	1.22 NS
3.	Lack of documentation	0	50	**12.1***
4.	Delay in receiving at destination for more than 10 minutes	1	5	1.70 NS
B.	**Ventilation Equipment Issues**			
1..	Problems with alarms	1	1	0.00 NS
2..	Transport ventilator failure	1	11	3.07 NS
3.	Low battery	0	1	1.70 NS
C.	**Oxygen Source Issues**			
1.	Near empty oxygen cylinder	0	1	1.22 NS
2.	Oxygen cylinder not ON	0	4	**2.58***
3.	Failure in oxygen source at destination	0	3	**2.14***

D.	Cardiac Monitor Issues	Experimental group (n=50)	Control group (n=50)	PROPORTION TEST 'Z'
1.	Monitor failure	0	1	1.70 NS
2.	Interference in monitoring	2	5	1.38 NS
3.	Unsuitable screen display	0	7	**3.31***
4.	ECG lead disconnection	1	3	1.02 NS
5.	Low Battery	0	2	1.74 NS
E.	**Syringe Pump Issues**			
1.	Tubing tangles	0	6	1.74 NS
2.	Failure to restart ongoing infusions after procedure	0	2	**3.06***

P < 0.05 *- Significant NS- Non Significant

Table 4 shows reduction in complications when compared with experimental and control group. Statistically there is a significant reduction in hypoxic event, Lack of preparedness for transport, lack of documentation, transport ventilator failure, oxygen cylinder not turned ON, failure in oxygen source at destination, unsuitable screen display, failure to restart ongoing infusion after procedure are reduced significantly in experimental group compared when with control group at a level of significance P<0.05. Clinically after the implementation of the checklist there is significant reduction in occurrence of cardiac arrest which is a life saving task.

SECTION E

ASSOCIATION OF DEMOGRAPHIC VARIABLES WITH TRANSPORT RELATED COMPLICATIONS.

TABLE 5: Association between presence of complications and age of patients in experimental group.

COMPLICATIONS		Age						Total	Significance
		18- 40		41-60		61-80			
		n	%	n	%	n	%		
Hypoxic Event	Absent	20	40.8%	16	32.7%	13	26.5%	49	$\chi 2=1.98$ NS
	Present			1	100.0%			1	
Lack of preparedness for transport	Absent	20	40.0%	17	34.0%	13	26.0%	50	$\chi 2=0.00$ NS
Lack of Documentation	Absent	20	40.0%	17	34.0%	13	26.0%	50	$\chi 2=0.00$ NS
Failure in oxygen source at destination	Absent	20	40.0%	17	34.0%	13	26.0%	50	$\chi 2=0.00$ NS
Oxygen cylinder not turned ON	absent	20	40.0%	17	34.0%	13	26.0%	50	$\chi 2=0.00$ NS
Transport ventilator failure	absent	20	40.8%	16	32.7%	13	26.5%	49	$\chi 2=1.98$ NS
	Present			1	100.0%			1	
Unsuitable monitor Screen display	absent	20	40.0%	17	34.0%	13	26.0%	50	$\chi 2=0.00$ NS

Since the calculated chi square value is greater the $P \leq 0.05$, it depicts that age of the subjects in experimental group are not associated with complications.

TABLE 6: Association between presence of complications and age of patients in control group.

COMPLICATIONS		Age						Total	Significance
		18- 40		41-60		61-80			
		n	%	n	%	n	%		
Hypoxic Event	Absent	9	23.1%	15	38.5%	15	38.5%	39	$\chi 2=0.92$ NS
	Present	2	18.2%	6	54.5%	3	27.3%	11	
Lack of preparedness for transport	Absent	11	22.4%	14	40.8%	15	36.7%	40	**c2=7.40***
	Present			7	70.0%	3	30.0%	10	
Lack of Documentation	Present	11	22.0%	21	42.0%	18	36.0%	50	$\chi 2=1.98$ NS
Failure in oxygen source at destination	Absent	11	23.4%	18	38.3%	18	38.3%	47	**c2=6.14***
	Present			3	100.0 %			3	
Oxygen cylinder not turned ON	Absent	11	23.9%	20	43.5%	15	32.6%	46	$\chi 2=3.09$ NS
	Present			1	25.0%	3	75.0%	4	
Transport ventilator failure	Absent	9	23.1%	18	46.2%	12	30.8%	39	$\chi 2=2.16$ NS
	Present	2	18.2%	3	27.3%	6	54.5%	11	
Unsuitable monitor Screen display	Absent	8	18.6%	20	46.5%	15	34.9%	43	$\chi 2=3.20$ NS
	Present	3	42.9%	1	14.3%	3	42.9%	7	

P < 0.05 S – Significant NS – Non Significant

The above table 6 shows the association between complications and their age in the control group patients. Lack of preparedness for transport and failure in oxygen source at destination were significantly associated with age of patient in control group. Statistical significance was calculated using chisquare test at P< 0.05 level of significance.

TABLE 7: Association between presence of complications and sex of patients in experimental group.

COMPLICATIONS		Sex				Total	Significance
		Male		Female			
		n	%	n	%		
Hypoxic Event	Absent	31	63.3%	18	36.7%	49	χ^2=2.28 NS
	Present			1	100.0%	1	
Lack of preparedness for transport	Absent	31	62.0%	19	38.0%	50	χ^2=0.00 NS
Lack of Documentation	Absent	31	62.0%	19	38.0%	50	χ^2=0.00 NS
Failure in oxygen source at destination	Absent	31	62.0%	19	38.0%	50	χ^2=0.00 NS
Oxygen cylinder not turned ON	Absent	31	62.0%	19	38.0%	50	χ^2=0.00 NS
Transport ventilator failure	Absent	31	63.3%	18	36.7%	49	χ^2=2.28 NS
	Present			1	100.0%	1	
Unsuitable monitor Screen display	Absent	31	62.0%	19	38.0%	50	χ^2=0.00 NS

$P < 0.05$ NS – Non Significant

Table 7 depicts that as the calculated chi square value is greater than P<0.05. Since sex of the subjects in experimental group are not associated with complications.

Table 8: Association between presence of complications and sex of patients in control group.

COMPLICATIONS		Sex				Total	Significance
		Male		Female			
		n	%	n	%		
Hypoxic Event	Absent	30	76.9%	9	23.1%	39	c**2=6.48***
	Present	4	36.3%	7	63.7%	11	
Lack of preparedness for transport	Absent	34	69.4%	15	30.6%	49	χ2=2.84 NS
	Present			1	100.0%	1	
Lack of Documentation	Present	34	68.0%	16	32.0%	50	χ2=0.00 NS
Failure in oxygen source at destination	Absent	33	70.2%	14	29.8%	47	χ2=1.76 NS
	Present	1	33.3%	2	66.7%	3	
Oxygen cylinder not turned ON	Absent	32	68.1%	15	31.9%	47	χ2=0.00 NS
	Present	2	66.7%	1	33.3%	3	
Transport ventilator failure	Absent	28	71.8%	11	28.2%	39	χ2=0.00 NS
	Present	6	54.5%	5	45.5%	11	
Unsuitable monitor screen display	Absent	29	67.4%	14	32.6%	43	χ2=0.04 NS
	Present	5	71.4%	2	28.6%	7	

P < 0.05 S- Significant NS – Non Significant

Table 8 shows the association between complications and gender of patients in control group. Hypoxic event is significantly associated with sex of patients in control group. Statistical significance was calculated using chisquare test at <0.05 level of significance.

CHAPTER V

DISCUSSION, SUMMARY, CONCLUSION, IMPLICATIONS, LIMITATIONS AND RECOMMENDATIONS.

This chapter deals with discussion, summary and conclusion drawn from the study. The study limitations, implications and recommendations in different areas of nursing practice, nursing administration, nursing research and nursing education in the future are considered here.

Intra hospital transport associated complications seems to be a life threatening cause for critically ill patients, especially in Intensive Care Units. Many guidelines have been developed for transport of critically ill patients. It supports that checklist for transport of critically ill patients improve the quality of transport. This study assessed the effectiveness of Modified Intra Hospital Transport Checklist in reducing transport related complications. Incorporating this intervention in intra hospital transport helps to reduce complications associated with transport of critically ill patients.

This is a quasi experimental non equivalent control group post only design, aims at evaluating the Effectiveness of Modified Intra Hospital transport Checklist in reducing transport related complications among critically ill patients in Intensive Care Units at KMCH, Coimbatore. The study was conducted among 100 patients, 50 in control group and 50 in experimental group.

Data was collected from Medical and Surgical Intensive Care Units of Kovai Medical Center and Hospital, Coimbatore. Initially, data were collected from the control group. The control subjects were transported using routine practice as followed. Data was collected using participatory observation technique. The patients in the intervention group were transported with transport checklist formulated by the researcher. Subjects were assessed for complications.

Observation checklist on complications was used to assess the occurrence of Intra hospital transport related complications among critically ill patients. The observation checklist comprises of recording of physiological parameter of subjects in pre transport,

during transport and post transport phases. According to the parameters the complications are classified as major , minor complications and miscellaneous issues. The study findings are discussed in light of the objectives.

DISCUSSION

Demographic variables of patients undergone intra hospital transport

Majority of the subjects, 40% (21) in experimental group were in the age group of 18-40 years, where as in control group large number of subjects were in 41-60 group. With regards to sex, 62%(31) and 68% (34) were males in experimental and control group respectively.

Clinical variables of patients undergone intra hospital transport

The salient characteristics of the subjects were that both the groups consists of mix of patients with varied diagnosis such as trauma, neurologic disorder, respiratory disorder, cardiovascular disorder and miscellaneous conditions. Majority of the transport were accompanied by nurse and respiratory therapist 80%(40) and 74%(37) in both groups.

Maximum duration of transport of critically ill patients was half an hour to one hour in both experimental 72%(36) and control group 60%(30). Among subjects 32%(16) in experimental group and 22%(11) in control group were supported with inotrophs. Majority of the subjects 64% (32) in experimental group and 60%(30) in control group were on invasive ventilation. Out of 100 patients, 76%(38) in experimental group and 86%(43) in control group were transported for CT scan.

The first objective of the study was to assess the frequency and nature of occurrence of intra hospital transport related complications among critically ill patients.

The control group subjects has frequent occurrence of complications during intra hospital transport. Major complications in control group were hypoxic event with 22% occurrence, hypotensive event 4%(2), arrhythmias 2%(1), and cardiac arrest 4%(2)

where as in experimental group only hypoxic event 2%(1) were present and no other complications were present.

Majority of the subjects in control group had occurrence of minor complications such as airway equipment disconnection 2%(1), accidental disconnection of inotroph 2%(1) were present in the control group where as in experimental group there was none.

With regards to miscellaneous issues, the factors that could have lead to the occurrence of major and minor complications can be attributed to lack of preparedness (20%), lack of documentation of care 100%(50) and lack of interdepartmental communication (2%). With respect to ventilation equipment issues 22%(11) had occurrence of transport ventilator failure where as it is markedly reduced in experimental group 2%(1). On the basis of oxygen source issues, oxygen cylinder flow was closed in 8%(4) of transports in control where as in experimental group no issues with oxygen source issues. In terms of cardiac monitor issues 10% (n=5) had interference in monitoring 10%(5) in control group where as in experimental group 4% (n=2) had interference in monitoring and 14%(7) had unsuitable screen display in control group where as in experimental group no issues in display screen modes. Observation on syringe pump issues 12%(6) had tubing tangles in control group where as in experimental group was none.

The present study finding was substantiated by similar study done by Venkategowda, et.al, (2014). They assessed unexpected events occurring during the intra hospital transport of critically ill patients using prospective observation method in a tertiary hospital. Total of 254 patients were observed the overall unexpected events observed were 139. The study reveals that maximum miscellaneous causes was like oxygen probe or ECG lead displacement. Major complications were fall in SPO_2>5%, BP variation > 20% from baseline, altered mental status and arrhythmias. The study says that unexpected events can be reduced when critically ill patients are accompanied by medically qualified person during transport and following strict transport guidelines.

The second objective of the study was to determine effectiveness of modified intra hospital transport checklist in reducing transport related complications among critically ill patients.

The subjects in the experimental group received the Modified Intra Hospital Transport Checklist before the time of transport. Accompanied the patient along with checklist during transport. The checklist which covered all the three phases of transport assist in following a sequence of care. When compared to the control group complications there is a significant reduction in experimental group complications. Two sample binomial proportion test reveals that after comparison with the control group complications and experimental group complications, statistically and clinically there is a significant reduction in experimental group complications. At a significance level of less than 0.05. The higher rate of occurrence were in major events like hypoxic spells (22%) and cardiac arrest (4%) in control group transfers could be attributed to lack of preparedness (20%) for transport and lack of documentation (100%). The other factors that contributed to both major and minor events are failure in transport ventilator 22%, oxygen cylinder kept closed (8%), failure in oxygen source at destination (6%) and failure to restart ongoing infusions after procedure (4%). The outcome shows that after the implementation of the checklist there is reduction in these events. The maximum time required by the staff nurses to fill up the checklist was 5-7 minutes in each phase. Nurses stated that the user friendliness of the checklist was good and comprehensive and it reduces the chance of forgetting things.

Brunsveld-Reinders, et.al, (2015) conducted a study in a 29 bed tertiary ICU at Netherlands. This study developed a checklist to increase safety of intra hospital transport in critically ill patients. They did three complementary methods to develop the checklist. They 1) reviewed the available literature on IHT guidelines and checklist, 2) did an analysis of complications related to IHT, 3) did an inventory of what could go wrong during IHT and how to prevent its accumulation through structured interviews with ICU doctors and ICU nurses. Based on these results developed a checklist and assessed the feasibility and usability of the checklist. Study concluded that checklist provided a continuity of care to enhance patient safety.

The third objective of the study was to associate the demographic variables with transport related complications.

Chi square test was used to find out the association between the demographic variables and complications. In present study, lack of preparedness for transport and failure to restart ongoing infusions after procedure are significantly associated with age of control group subject and also hypoxic event is significantly associated with gender of control group subjects, at a level of significance of less than 0.05.

Marshall (2002) conducted a study in mid Atlantic tertiary care medical center. This study revealed that in 28% (n=16) of transports the patient was less than fifty years old. In this study younger patients admitted to the ICU have higher level of acuity (63% had APACHE III score greater than 60), are more dependent on technology (100% on mechanical ventilation), and are at greater risk for developing physiologic instability. All of these factors place them at a greater risk for experiencing an adverse event. While age of the patients are reported in all related studies as descriptive data, no previous study has directly examined the predictive association between patient age and the occurrence of an adverse event.

SUMMARY

The study was conducted to assess the Effectiveness of Modified Intra Hospital Transport Checklist to reduce transport related complications among critically ill patients in ICU's at KMCH, Coimbatore.

MAJOR FINDINGS OF THE STUDY

- The resulting 'χ^2' value for demographic and clinical variables suggest there is no significant difference between the experimental and control group. This documents the homogeneity between the experimental and control groups before intervention.
- Out of 50 control group subjects, occurrence of major complications were 16, minor complications were 3, miscellaneous issues were 113.
- Out of 50 experimental group subjects after implementation of transport checklist, occurrence of major complications were 1, no occurrence of minor complications,

miscellaneous issues were 8. This depicts that the implementation of a Intra Hospital Transport Checklist had reduced the major, minor and miscellaneous complications of patients.

- Two sample binomial proportion test results 3.07, after comparison with hypoxic event between experimental and control group. This reveals that there is a significant reduction in hypoxic event after implementation of Intra hospital transport checklist.
- The tested 'Z' value for lack of preparedness for transport between experimental and control group is 4.01. This depicts that after implementation of Modified Intra Hospital Transport Checklist there is proper preparation done before transport of patients.
- The proportion value for lack of documentation between experimental and control group is 12.1. The value reveals that there is significant increase in documentation of care during pre transport, during transport and post transport phases after implementation of Modified Intra Hospital Transport Checklist.
- The obtained 'Z' value for transport ventilator failure between experimental and control group is 3.07. This shows that after implementation of transport checklist, the selection of proper transport ventilator reduced the events of transport ventilator failure.
- The compared 'Z' value for oxygen cylinder not ON between experimental and control group is 2.58, which shows that after the implementation of Modified Intra Hospital checklist there is significant decline in starting oxygen supply with oxygen cylinder kept closed**.**
- The 'Z' value for failure in oxygen source at destination between experimental and control group is 2.14. This reveals that there is significant decrease in occurrence of failure in oxygen source after implementation of Modified Intra Hospital Transport Checklist.
- The obtained 'Z' value for unsuitable screen display in cardiac monitor between the experimental and control group is 3.31. This depicts that the screen display is better after implementation of Modified Intra Hospital Transport Checklist.
- The 'Z' value for failure to restart ongoing infusions after procedure between experimental and control group is 3.06. This shows that after the implementation of the checklist there is a significant mounted increase in restarting the ongoing infusions after procedure when returned back to ICU.

- The calculated 'χ^2' value for lack of preparedness for transport and age of subjects in control is 7.40. This shows there is an association between lack of preparedness for transport and age of patients in control group.
- Chi square value for failure to restart ongoing infusions after procedure and age of subjects in control group is 6.14, which shows an association between failure to restart ongoing infusions after procedure and age of patients in control group.
- The tested 'χ^2' value for hypoxic event and gender of the subjects in control group is 6.48. This depicts an association between hypoxic event and gender of patients in control group.

CONCLUSION

The results of the study showed that there was a significant difference in the occurrence of complication between the patients who received modified Intra Hospital Transport checklist and those who received routine care. The important aspect of prevention of transport related complications are strict follow up of transport guidelines using checklist and multidisciplinary transport team. The transport checklist will help in following a sequence of best practices and proper recording and documentation of patient parameters during transport. The investigator could find a reduction in complication after the execution of the transport checklist. Hence the hypothesis that there is a significant reduction in transport related complications among critically ill patients after implementation of modified intra hospital transport checklist is accepted.

IMPLICATIONS

The study has implication in different areas of nursing mainly, nursing practice, nursing education, nursing administration and nursing research.

Nursing practice

- Benefits of transport have to be weighed against possible risks.
- Nurses has to follow transport protocol when shifting patient out of ICU.
- Transport related complications can be reduced to a greater extent with the proper implementation of transport checklist.

- Knowledge about potential risks and benefits can aid the critical care nurse in preventing complications and avoid negative outcomes associated with transport.
- A simple and clear institutional policy and unit protocol should be formulated and made available to all nurses in Intensive Care Unit.
- Protocol assist in coordination of the transport with the testing area, enhance communication with the transport team and helps to identify the type of personnel needed to accompany the patient.
- Transport protocol should be taught to the staff nurses during their induction training.

Nursing education

- Nursing students should be taught about basic principles in transporting of patients.
- Nursing students need to be educated about the importance of diligently transporting patients and make them understand that, it is a specific and challenging nurses role.
- Nursing curriculum should include session on transport of critically ill patients and standardized recommendations should be taught to the students.
- Transport of critically ill patients should be taught to the students as workshop session with hands on training session with equipments and encourage students to do return demonstration.

Nursing administration

- Nursing administration need to establish standardized protocol to transport critically ill patients.
- Nurse administrator should plan and organize continuing nursing education on prevention of transport related complications.
- Policies and protocols should be made clear to the nurses in Intensive Care units about transport of critically ill patients.
- Facilities to implement modified transport checklist should be made available.

Nursing research

- The study provides scope for future research on transport of critically ill patients.
- Utilization of evidence based facts improves overall quality of nursing care.

- Dissemination of study finding helps novice researchers to lay a better foundation for their research.
- Further research should be conducted to frame standard protocols to prevent transport related complications in health settings.

LIMITATIONS

1. Study was limited to a small setting without randomization.

2. The result cannot be generalized to other hospital ICU's.

RECOMMENDATIONS

1. The study can be replicated involving larger population and sample for a longer period. So the findings can be generalized.

2. A similar study can be done in different setting.

3. A randomized control trial can be carried out to assess the effectiveness of transport protocol in reducing transport related complications over a period of six months to one year.

4. The study can be done by selecting the patients based on APACHE II score to determine the severity of illness, there by maintaining perfect homogeneity among both the groups.

5. A study can be conducted to assess the effectiveness of implementing a transport personnel for transporting critically ill patients.

6. A study can be initiated to find the complications associated with mechanically ventilated patients undergoing transport.

ABSTRACT

The present study entitled" A study to Assess the Effectiveness of Modified Intra Hospital Transportation Checklist to Reduce Transport Related Complications Among Critically ill Patients in ICU's at KMCH, Coimbatore was undertaken in partial fulfillment of the requirements for the Degree of Master of Science in Nursing at KMCH College of Nursing, Coimbatore, which is Affiliated to the Tamilnadu Dr. M. G. R. Medical University Chennai, during the year 2015-2016.

Objectives: To assess the frequency and nature of occurrence of intra hospital transport related complications among critically ill patients. To determine the effectiveness of modified checklist in reducing transport related complications among critically ill patients. To associate the demographic variables with transport related complications. **Research Design:** Quasi experimental non equivalent control group post only design. **Setting:** Medical and Surgical Intensive Care Units at KMCH, Coimbatore. **Sample:** 100 patients, subjected to undergo Intra Hospital Transport, 50 in control group, 50 in experimental Group. **Sampling Technique:** Non Probability convenient sampling technique. **Tools:** Demographic Variables, Clinical Variables, observation checklist to observe the transport related complications and a questionnaire to assess the feasibility and usability of the checklist. **Data collection method:** Prospective Participatory Observation technique. Subjected patients to undergo Intra Hospital transport to Computerized Tomography, Magnetic Resonance Imaging, Angiography are selected and extracted their demographic and clinical variables from the records. Subjects in the control group were transported using routine transport practice as followed. Using participatory observation technique, subjects in control group were assessed for transport related complications. Training session for the staff nurses on modified intra hospital transport checklist were taught after assessing the control group complications. Subjects in the experimental group were transported with modified intra hospital transport checklist. The modified transport checklist was adopted by the accompanying nurse before the transport starts. Using participatory observation technique experimental group subjects were assessed for complications. Among the 50 control group patients the overall events observed were 132 and among 50 experimental group patients the overall

events observed were 7. **Results:** There was a significant reduction in occurrence of transport related complications among patients in experimental group ($P < 0.05$). **Conclusion:** The results confirmed that the implementation of Modified Intra Hospital Transport checklist is effective in reducing transport related complications among critically ill patients.

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APPENDICES

DATA COLLECTION TOOL

PART – I

VARIABLES OF THE SUBJECTS

SAMPLE NO:

DEMOGRAPHIC VARIABLES

a) Age:

1) 18-40yrs □
2) 41-60yrs □
3) 61-80yrs □

b) Gender :

1) Male □
2) Female □

CLINICAL VARIABLES

a) Diagnosis of the underlying disease

1) Neurologic disorders □
2) Cardiovascular disorders □
3) Respiratory disorders □
4) Gastrointestinal disorders □
5) Trauma □
6) Others □

b) Number of personnel accompanying the transport

1) Nurse □
2) ICU doctor, Nurse, Respiratory Therapist □
3) Nurse, Respiratory Therapist □

c) Duration of absence from ICU

1) Upto ½ hour □
2) ½ - 1 hour □
3) 1 - $1_{1/2}$ hours □
4) $1_{1/2} \geq$ 2hours □
5) More than 2 hours □

d) Inotropic support

1) Yes
2) No

e) Mode of ventilation

1) Mechanical ventilation □
2) Non invasive ventilation □
3) Room air ventilation □

f) Transport destination

1) CT
2) MRI
3) Angiography
4) Others

g) Drain

1) Present
2) Absent

PART II

OBSERVATION CHECKLIST

PHYSIOLOGICAL PARAMETERS

PARAMETERS	PRE TRANSPORT	DURINGTRANSPORT	POST TRANSPORT
HR (bpm)			
Rhythm			
RR (bpm)			
SPO_2 (%)			
Supplemental Oxygen (%)			
Mode of Oxygen Delivery			
BP (mmhg)			
Temperature (F)			
Mental Status (GCS)			

I. MAJOR COMPLICATIONS

Sl. No.	COMPLICATIONS	ü	X
1.	20mmhg decrease in systolic and 10mmhg decrease in diastolic pressure from baseline for more than 5 min (Hypotensive event)		
2.	20mmhg increase in systolic and 10mmhg increase in diastolic pressure from baseline for more than 5 min (Hypertensive event)		
3.	Arrhythmias		
4.	SPO_2 fall >5% from baseline for more than 1 min (Hypoxic event)		
5.	Cardiac Arrest		
6.	Altered mental status		
7.	Accidental extubation		
8.	Accidental central line catheter removal		
9.	Disconnection / removal of chest tube		
10.	Temperature $<35^0C$ (Hypothermia)		

II. MINOR COMPLICATIONS

Sl.No.	COMPLICATIONS	ü	X
1.	Nasogastric tube displacement		
2.	Peripheral venous access incident (accidental dislodgement, disconnection, thrombosis)		
3.	Central venous catheter incident (disconnection / thrombosis)		
4.	Arterial line incident (disconnection / thrombosis)		
5.	Accidental dislodging of urinary catheter		
6.	Disconnection of endotracheal tube / tracheostomy tube		
7.	Disconnection of airway equipment		

SL.No.	III. MISCELLANEOUS ISSUES	ü	X
A)	**Preparedness and documentation issues**		
1.	Lack of preparedness for transport		
2.	Lack of communication with concerned department		
3.	Lack of documentation in medical chart		
4.	Delay in receiving the patient at destination more than 10 minutes		
B)	**Ventilation equipment issues**		
1.	Problems with alarms		
2.	Transport ventilator failure		
3.	Low battery		
C)	**Oxygen source issues**		
1.	Near empty oxygen cylinder		
2.	Oxygen cylinder not ON		
3.	Failure in oxygen source at destination		
D)	**Cardiac monitor issues**		
1.	Monitor failure		
2.	Interference in monitoring		
3.	Unsuitable screen display		

4.	ECG lead disconnection		
5.	Failure in saturation probe		
6.	Problems with alarms		
7.	Low battery		
E)	**Syringe pump issues**		
1.	Absence of additional pumps to replace		
2.	Tubing tangles		
3.	Problems with alarms		
4.	End of medication without replacement		
5.	Failure to restart ongoing infusions after procedure		
6.	Low battery		

PART – III

QUESTIONNAIRE USED TO ASSESS FEASIBILITY AND USABILITY OF CURRENT CHECKLIST.

I. Content of the Checklist

1. Did you miss questions in the checklist?
   a. In the pre-transport checklist?
      Yes
      No
      If 'Yes', please specify ……..
   b. In the transport checklist?
      Yes
      No
      If 'Yes', please specify ……..
   c. In the post-transport checklist?
      Yes
      No
      If 'Yes', please specify ……..
2. Does the checklist contain unnecessary questions?
      Yes
      No
      If 'Yes', please specify ……..
3. Did you skip checklist items while you used the checklist?
      Yes
      No
      If 'Yes', please specify ……..

II. User friendliness

4. Was it easy to fill the checklist?
      Yes
      No
5. Was it useful to fill the checklist?
      Useful
      Impractical
6. When did you fill the following transport phases?
   a. The pre-transport phase
      Before transport
      During transport
      After transport
   b. The transport phase

Before transport
During transport
After transport

c. The post-transport phase
Before transport
During transport
After transport

7. Did you have sufficient time to fill in the checklist?
   a. The pre-transport checklist?
      Yes
      No
   b. The transport checklist?
      Yes
      No
   c. The post-transport checklist?
      Yes
      No
8. How much time you took to fill in the checklist in the different phases? (in minutes)
   Pre-transport-
   During transport-
   Post-transport-
9. Did you check the checklist items by yourself?
   Yes
   No
10. Did you check the checklist items with a second person?
    Yes
    No

Specify, if yes.....

APPENDIX B

ROUTINE TRANSPORT PRACTICE

EQUIPMENTS AND MATERIALS USED

- Transport tray which accomdates varies sizes of Endotracheal tubes, Manual resuscitation bag, bains, ET plasters and ties, suction catheter according to patient ET size, all sizes of venflons, workable battery charged laryngoscope, anatomical mask 0,1, 4, oropharyngeal airway (00, 0,1,2,3,4), electrodes, additional fluids like NS 500ml, NS 1000 ml, NS 100ml, 20% Mannitol 100ml, IV set, 10 cm extension gloves sterile 6.5, 7, 7.5, Water for injection, Syringes of all size,
- Emergency drugs tray which includes Inj. Adrenaline 1/1000, Inj.Adrenaline 1/10000, Inj.Atropine 1.8mg, Inj.Amiodarone 150 mg, Inj.Calcium Gluconate 1gm, Inj.Hydrocortisone 100mg, Inj.Sodium Bicarbonate 7.5%, 50ml syringe, 10ml syringes, 5ml syringes, water for injection.
- Sedation and relaxant tray such as Inj.Midazolam, Inj.Propofol, Inj.Haloperidol, Inj.Fentanyl and muscle relaxants such as Inj.Atracurium, Inj.Vecuronium.
- Memory capable Cardiac monitor with stand
- Memory capable Transport ventilator if applicable.
- Oxygen cylinder

GENERAL CONDITIONS

- All patients undergoing intra hospital transport should be accompanied with this necessary equipments and materials.
- Urometer should be emptied before patient transport.
- Patients on inotropic supports are supposed to be transported with additional syringe pumps and extra loading inotrophs.
- Mechanically ventilated patients are supposed to be shifted with adequate sedation and muscle relaxants agents.
- Minimum of two intravenous access should be secured before shifting the patient
- Ensure battery capacity for equipments such as cardiac monitor, transport ventilator, laryngoscope and syringe pump.

- Ø Appropriate alarm setting for equipments.
- Ø Arrhythmia patients should be shifted with defibrillator.
- Ø Patients with head injury (not ruled out) should be immobilized in a cervical collar before transport.
- Ø Patients suspected of spine injury should be transported with spine board.

APPENDIX C

MODIFIED INTRA HOSPITAL TRANSPORT PROTOCOL

Intra hospital transport is specific role of nurse. Every critical care nurse come across this role during their period of experience. And an adherence to a protocol gives clarity and quality of care.

OBJECTIVES

- To assess the risks and benefits in moving patient out of the ICU.
- Proper selection of accompanying personnel.
- Practice and follow transport checklist.
- Documentation of adverse events related to transport of patient.

CONTRAINDICATIONS

- Inability to provide adequate oxygenation and ventilation to patient.
- Inability to maintain acceptable hemodynamic parameters.
- Inability to adequately monitor patient cardiopulmonary status.
- Inability to maintain airway control.
- Transport should not be undertaken unless all the necessary members of the transport team are present.

TRANSPORT PERSONNEL

- It is recommended that a minimum of two people (Nurse – Respiratory therapist / Nurse-Nurse), in addition to the ward boy/girl, should accompany a critically ill pt.
- Second seniors and third seniors are responsible for the intra hospital transport of patients occur in their respective shifts.
- The transport staff has to follow the transport checklist and maintain documentation.
- Mechanically ventilated patients should be accompanied by the primary nurse and respiratory therapist in addition to the ward boy/girl.

- It is strongly recommended that a physician with training in airway management and ACLS, and critical care training or equivalent, accompany unstable patients.
- The team must be proficient in operation and troubleshooting of the all equipments used for transport of patients.
- The transferring personnel should be familiar with the patient's history, condition and special requirements to allow appropriate planning and anticipation of problems unique to the patient.

DECISION FOR TRANSPORT

- When no other diagnostic or interventional procedure can meet the need for transport.
- Decided by Intensivist, Primary Physician and Patient family.

PROTOCOL	RATIONALE
ASSESSMENT - Assessment of patient and situation - Benefits must outweigh the risk - Stabilize patient before transport - Anticipation of problem likely encountered en route - Degree of urgency to transfer	To plan a systematic routine for transport of patients. To analyze the upcoming complications. Early transfer of patient reduces irreversible complications in patient.
PRE TRANSPORT PHASE **Equipment and checks** • Check transport tray: • AMBU as per patient -1 • Scope handle with battery, functioning blade-1 • Anatomical mask 0'1'4 -1 • Bains-1 • Airway 00, 0, 1, 2, 3, 4 -1 • Et tube as per patient -1	A mobile ICU setup needed for transporting ICU patients out of ICU.

• 10cm Extension-1 • Glove sterile 6.5, 7, 7.5 -2 • Suction catheter as per patient ET tube size-3 • Electrodes-5 • Patient Sethescope-1 • Patient torch-1 • NS 500 ML-1 • NS 1000 ML-1 • NS 100 ML-1 • 20% Mannitol 100 ML-2 • Venflons of all gauges-1 • IV Set-1 • Water for injection-5 • Syringes of all size-3 • Patient glove box	
• Oxygen cylinder (Estimate 30min more than needs)	For backup.
• Length and patency of intravenous line should be adequate. • Monitor stand to fix monitor • Unnecessary intravenous infusions should be disconnected. • Head end elevation (30-45 degree) • Patient on arterial line and with continuous CVP monitoring: Label, level and zero pressure transducer	To avoid disconnection and dislodgement of lines. Adequate visibility. Avoid too many infusions and equipments for proper wheeling. To prevent Ventilator associated pneumonia.
• Switch airbed to transport mode • Empty the urometer and maintain dependent drainage. • Enteral feeding: Either stop for time being	To lock the air inside the airbed. To avoid spillage, backflow of urine, reduce weight on urometer.

/aspirate if necessary/ give as bolus after arrival. • Check blood sugar for NPO patients. • Soiled linen to be changed • Patient records should be accompanied with the patient. **Additional equipments** • Unstable cardiac patients should be accompanied with defibrillator • Patients with head injury (not ruled out) should be immobilized in a cervical collar before transport. • Patients suspected of spine injury should be transported with spine board. **Medication trays and due requirements** • Check Emergency medication tray • 50ml Syringe-1 • 5ml Syringe-3 • 10ml Syringe-3 • Water for Injection-3 • Inj.Amiodarone 150mg-3 • Inj.10% Calcium Gluconate 1gm-2 • Inj.Hydrocortisone 100mg-2 • Inj.Sodium Bicarbonate 7.5%-2 • **Loaded medication** • Inj.Adrenaline 3ml (1ml=1mg)-1 • Inj.Adrenaline 1 in 10,000-1 • Inj.Atropine 2ml (1ml=0.6mg)-1 • Check sedation and relaxant tray • **Sedatives** • Inj.Midazolam-1	To prevent hypoglycemic episode. To prevent cross infection. To review the patient details. To prevent irreversible complications.

• Inj.Propofol-1 • Inj.Haloperidol-1 • Inj.Fentanyl-1 • **Relaxants** • Inj.Atracurium-2 • Inj.Vecuronium-1 • Carry off scheduled antibiotics as per due order • Patient on definitive ongoing medication like inotrophs, NTG, strict BP control infusions should be accompanied with additional loading medication and extra battery charged syringe pumps. **Battery charged equipments** • Before setting for transport confirm adequate battery charge in transport ventilator, cardiac monitor, syringe pump and laryngoscope. **Communication** • Before shifting the patient get the clearance from primary consultant, patient attenders and concerned department. **In case of MRI** • Check for the MRI suitability. • Indicate if patient having aneurysm clips/ shunt (spinal or intraventricular), metallic stent, filter, or coil, cardiac pacemaker/ pacing wires, implanted cardioverter defibrillator (ICD), ocular (eye) or cochlear (ear) implant, wire mesh implants, surgical staples, clips or metallic sutures, orthopaedic implants, heart valves prosthesis/ any type of prosthesis, vascular	To prevent interruption in monitoring patient parameters. To prevent administrative issues. To assess whether the patient is right candidate for MRI.

access port and/ catheter, any metallic fragment or foreign body, IUD, diaphragm or pessary, dentures or partial plates, hearing aid (remove before entering MRI room), claustrophobia.	
• Apply 2 pressure lines for necessary infusion and keep 1 pressure line ready in the transport tray.	To prevent failure in administering ongoing medication or inotrophs.
Cardiac monitor	
• Set 1 wave A mode in waves and ensure visibility of the monitor • Check and set visual audible alarms • Set SPO_2 QRS volume 10 • Appropriate alarm setting for heart rate, saturation, respiratory rate and blood pressure. • In case of CT thorax or abdomen, if its indicated to remove the ECG leads change heart rate to pulse rate and monitor the Pulse rate till imaging is got over.	Ensure visibility at far distance. As per recommendations heart rate , ECG, oxygen saturation and blood pressure monitoring is mandatory during transport. Early identification of complications. Maintain uniform care and monitoring for ICU patients even when patient is out of ICU.
Transport Ventilator	
• First turn ON oxygen cylinder and connect the tubing then start ventilation as per mode	To prevent Oxygen cylinder mishap.
• Mechanically ventilated patients should be adequately sedated, paralysed and ventilated. • Invasively ventilated patients should be suctioned before transport. • Apply heat moisture exchanger between ventilator and Endotracheal tube or tracheostomy tube.	To prevent the physiological changes occurring due to transport of patient. To clear the airway. To provide heat moistured oxygen.
• Check and set visual audible alarms • Appropriate alarm setting for tidal volume,	Early identification of complications.

FiO_2, Peak inspiratory pressure and leak. • Document the patient ET lip level and cuff pressure. • In case of failure in FiO_2 sensing in transport ventilator opt oxygen analyzer. **In case of CT scan with contrast** Large bore intravenous cannula should be present Document the serum creatinine in the transport checklist Administer renal protection protocol as per ICU CIN protocol. Collect the history regarding any previous contrast induced allergic reaction. Document if oral contrast has been administered. **In case of patient with drain tubes** • Document the type of drain present • Clamp the only if indicated • Place and secure the drain • Empty the drainage bag before transport • Maintain dependent drainage **Documentation** • Document Pre transport vital parameters when the Patient is connected with the ICU monitor and equipments.	For documentation and confirmation. To administer contrast. To rule whether the patient is eligible for contrast administration. Chest tube must never be clamped and occluded because this may effect the mechanical and spontaneous ventilation and reverse the re-expansion of the affected lung. Reduce the time of clamping EVD will prevent the increase in ICP.
DURING TRANSPORT **At destination** • Plug in oxygen at destination source • Switch off oxygen in cylinder • Check wall mounted flowmeter at destination	To prevent oxygen loss from cylinder

(confirm is it fixed, no leak, adequate O_2 supply and length for extension) • Use shifter to move the patient from ICU coat to procedure table and vice versa. • Explain the procedure to the patient (if conscious) • Ensure visibility of the monitor during procedure • Recheck ABCDE before leaving the procedure room. • During transport documentation of vital signs every 15 minutes is mandatory. • Documentation of additional fluids and medications administered during transport is mandatory. • In case of MRI, Invasive ventilated patients should be put on HME and document the $ETCO_2$.	Reduce manpower reduce damage to patient. Ensure safety A- Airway, B-Breathing, C-Circulation, D- Drugs and drains, E- Equipments should be ensured before leaving the procedure room.
POST TRANSPORT **Connecting with the patient after arrival at the ICU** • Turn ON Ventilation mode at bedside • Turn ON humidifier (if applicable) • Turn ON Patient Monitor • Stop extra sedatives • Untangle Intravenous pressure lines • Restart temporarily stopped intravenous infusion • Switch air bed to normal mode • Restart enteral feeding if stopped temporarily	To adapt back to ICU environment. Ensure safety.

• Replace used things in transport tray • Post transport vital signs should be documented after got connected with the ICU monitors and equipments. • Document the finding of the procedure or imaging done • Document issues experienced in transport of patient.	Development of staff knowledge and to improve the transport of critically ill patients.

1 wave A mode in monitor

APPENDIX – H

LIST OF EXPERTS

1. **Dr.M.N.Sivakumar, DA., DNB., IDCCM., EDIC.,**

   Head-Department of Critical care Medicine,

   Kovai Medical Centre & Hospital,

   Coimbatore-14

2. **Prof.DR.S.Madhavi, M.Sc. (N)., Ph.D.,**

   Principal and Head-Department of Medical Surgical Nursing,

   KMCH College of Nursing,

   Coimbatore-641014

3. **Prof. DR.K.Balasubramanian, M.Sc. (N)., Ph.D.,**

   Department of Medical and Surgical Nursing

   KMCH College of Nursing

   Coimbatore-641014.

4. **Prof. P.Viji, M.Sc (N).,**

   Department of Medical and Surgical Nursing

   KMCH College of Nursing

   Coimbatore- 641014.

5. **Prof.P.Kuzhanthaivel, M.Sc. (N).,**

   Department of Medical and Surgical Nursing

   KMCH College of Nursing

   Coimbatore-641014.

INTENSIVE CARE INTRA HOSPITAL TRANSPORT CHECKLIST

PATIENT LABEL	**Date**	
	Time of start from ICU	
	Time of arrival in ICU	
DIAGNOSIS	**Purpose of Transport**	
	To rule out	
	Type of Procedure	Diagnostic Interventional Both
	Transport Team	Nurse Respiratory Therapist Doctor

PRE-TRANSPORT

EQUIPMENTS & CHECKS	**YES**	**NO**	**NA**
Fully checked transport tray present			
Manual resuscitation bag & Bains present			
O_2 Cylinder (Estimate 30min more than needs)			
Check IV line length and patency			
Monitor stand, Pt. Stethoscope & Torch			
Disconnect unnecessary IV infusions			
Head end elevation (30-45 degree)			
Label, level & zero pressure transducer			
Switch airbed to transport mode			
Urometer (emptied/ dependent drainage)			
Enteral feeding (NPO/Aspirated)			
Soiled linen changed			
Patient Records			
MEDICATION TRAYS & DUE REQUIREMENTS			
Emergency Medication tray checked			
Sedation and Relaxant tray checked			
Carry off Scheduled Antibiotics			
Additional Inotropes & Syringe pump			
BATTERY CHARGED EQUIPMENTS			
Battery charged transport ventilator			
Battery charged cardiac monitor			
Battery charged syringe pumps			
Battery charged laryngoscopes			
COMMUNICATION			
Primary Consultant informed			
Patient Attenders informed			
Concerned Department informed			
IN CASE OF MRI			
MRI suitability checked			
Applied extension for pressure lines			

CARDIAC MONITOR	**YES**	**NO**	**NA**
Ensure visibility of monitor (Set 1 WAVE A)			
Check and set visual audible alarms			
Set SPO_2 QRS volume 10			

Alarm Limit Settings	HR	SPO_2	RR	BP

TRANSPORT VENTILATOR			
Turn ON O_2 cylinder and start ventilation as per mode			
Adequately sedated, paralysed and ventilated			
Suction before departure			
Put HME filter between ventilator and ET/TT			
Check and set visual audible alarms			

Alarm Limit Settings	VT	FiO_2	PIP	Leak

ET Lip level (cm)	
Cuff pressure (ET/TT)	

IN CASE OF CT SCAN WITH CONTRAST	**YES**	**NO**	**NA**
Large bore IV cannula present			
Serum creatinine			
Renal protection as per protocol			
Any H/o allergy to contrast			
Oral contrast administered			
IN CASE OF PATIENT WITH DRAIN			
Drain present :-			
Clamp (only if indicated)			
Appropriately placed and secured			
Emptied			
Dependent drainage			

DURING TRANSPORT

AT DESTINATION	YES	NO	NA
Plug in oxygen at destination			
Switch off oxygen cylinder			
Check wall mounted flow meter (Fixed, No leak, Adequate O_2 supply & length for extension)			
Explain the procedure to patient (if conscious)			
Check visibility on monitor during procedure			
Recheck ABCDE before leaving the procedure room. Algorithm :- A - Airway, B - Breathing, C – Circulation, D – Drugs & Drain tubes, E – Equipments.			

MEDICATIONS AND FLUIDS ADMINSTERED

MEDICATION	DOSAGE	ROUTE	TIME		IV FLUIDS	Bolus / Drops per min

VITAL SIGNS	Pre-transport	EVERY 15 MINUTES ONCE DOCUMENTATION									Post-transport
TIME											
HR											
Rhythm											
BP											
RR											
SPO_2											
Vent. Mode											
Tidal Volume											
PEEP/PS											
FiO_2											
PIP/ Pplat											
GCS											
Pupils L/R											
$ETCO_2$ (MRI)											

POST- TRANSPORT

CONNECTING PATIENT	YES	NO	NA
Turn ON ventilation mode at bedside			
Turn ON humidifier			
Turn ON patient monitor			
Stop extra sedatives			
Untangle Intravenous pressure lines			
Restart intravenous infusion			
Switch airbed to normal mode			
Restart Enteral feeding			
Replaced used things in transport tray			

SPECIFY (Findings)
SPECIFY (Issues In Transport)

Nurse : ……..... **Signature:** ……..

KMCH COLLEGE OF NURSING

(Approved by the Government of Tamil Nadu & The Tamil Nadu Nurses & Midwives Council, Chennai.
Recognized by the Indian Nursing Council, New Delhi and Affiliated to the Tamil Nadu Dr. M.G.R. Medical University, Chennai)
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Ph: (0422) 4323740, 2369321 Telefax : (0422) 2627525 Website: kmchcon.ac.in E-mail: nursing@kmch.ac.in

Ref: KMCT/ 4006/12/15

16- 12-2015

TO

Dr.M.N.Sivakumar, DA,DNB,IDCCM,EDIC.,

Head- Department of Critical Care Medicine,

Kovai Medical Center and Hospital,

Coimbatore.

Respected Sir/Madam

Sub: Permission to conduct a study

I submit that one of our M. Sc (N) final year student by the name Ms. Soumya Babu specializing in Medical Surgical Nursing in our college desires to conduct a study entitled "A Study to assess the effectiveness of Modified Intra Hospital Transportation Checklist to reduce transport related complications among critically ill patients in ICUs at KMCH, Coimbatore" as part of her M.Sc (Nursing) curriculum.

As she is in need of medical expert to complete her study, I request you to guide the student.

Thanking you,

Yours truly

Prof. DR. S. Madhavi, M.Sc. (N)., Ph.D.,
Principal.

The Principal,
K.M.C.H. College of Nursing,
P.B. No : 3209, Avanashi Road,
Coimbatore - 641 014.

COIMBATORE * KMCH COLLEGE OF NURSING *

Accepted

M.N. Siva

Dr.M.N. SIVAKUMAR DA DNB IDCCM,
Consultant ... Incharge
... Road, No. ...
Kovai M... Hospital
Coimbatore - 641 014 Tamil Nadu, INDIA

KMCH ETHICS COMMITTEE
KOVAI MEDICAL CENTER AND HOSPITAL LIMITED
Post Box No. 3209, Avanashi Road, Coimbatore - 641 014. INDIA
✆ : (0422) 4323800, 4323619 Fax : (0422) 4270805
E-mail : ethics@kmchhospitals.com
EC Reg. No : ECR / 112 / Inst / TN / 2013

Ref: EC/AP/428/02/2016
01.02.2016

APPROVED

To:
Prof. DR. S. Madhavi,
M.Sc (N)., Ph.D.,
Principal
KMCH College of Nursing
Coimbatore- 641 014
Tamilnadu, India.

Dear Prof. DR. S. Madhavi,

The proposal entitled **"A Study to Assess the Effectiveness of Modified Intra Hospital Transportation Checklist to Reduce Transport Related Complications Among Critically ill Patients in ICUs at KMCH, Coimbatore"** Submitted by **Ms.Soumya Babu** under your guidance was reviewed by the Ethics Committee in its meeting held on 30.01.2016 and permission is granted to carry out the study at Kovai Medical Center and Hospital Ltd, Coimbatore, India.

Thanking you,

Yours faithfully,

Dr. P. R. Muthuswamy
Chairman, KMCH Ethics Committee

Dr. P. R. MUTHUSWAMY,
MA.,MEA. FDPM(IIM-A)Ph.D.,
Chairman
Ethics Committee
Kovai Medical Center and Hospital
Avanashi Road,
COIMBATORE-641 014

Copy to: Medical Guide:
Dr.M.N.Sivakumar,
DA, DNB, IDCCM, EDIC.,
Head-Department of Critical Care Medicine
Kovai Medical Center and Hospital
Coimbatore

Research Guide:
Prof. DR. S. Madhavi,
M.Sc (N)., Ph.D.,
Principal
KMCH College of Nursing
Coimbatore

CERTIFICATION OF CONTENT VALIDITY

This is to certify that, I have pursued the research proposal submitted by Ms. Soumya Babu titled **" A STUDY TO ASSESS THE EFFECTIVENESS OF MODIFIED INTRA HOSPITAL TRANSPORTATION CHECKLIST TO REDUCE TRANSPORT RELATED COMPLICATIONS AMONG CRITICALLY ILL PATIENTS IN ICU'S AT KMCH, COIMBATORE".**

I found that the methodology and instruments are appropriate.

Place: Coimbatore

Date: 01.12.2015

Signature & Seal

CERTIFICATION OF CONTENT VALIDITY

This is to certify that, I have pursued the research proposal submitted by Ms. Soumya Babu titled **" A STUDY TO ASSESS THE EFFECTIVENESS OF MODIFIED INTRA HOSPITAL TRANSPORTATION CHECKLIST TO REDUCE TRANSPORT RELATED COMPLICATIONS AMONG CRITICALLY ILL PATIENTS IN ICU'S AT KMCH, COIMBATORE".**

I found that the methodology and instruments are appropriate.

Place: Coimbatore

Date: 10.12.2015

K. Balasubramani

Signature & Seal

CERTIFICATION OF CONTENT VALIDITY

This is to certify that, I have pursued the research proposal submitted by Ms. Soumya Babu titled **" A STUDY TO ASSESS THE EFFECTIVENESS OF MODIFIED INTRA HOSPITAL TRANSPORTATION CHECKLIST TO REDUCE TRANSPORT RELATED COMPLICATIONS AMONG CRITICALLY ILL PATIENTS IN ICU'S AT KMCH, COIMBATORE".**

I found that the methodology and instruments are appropriate.

Place: Coimbatore

Date: 14.12.2015

P. Kuyathi

Signature & Seal

KMCH COLLEGE OF NURSING
COIMBATORE-641014.